

Feb. 28, 1967

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3,305,987

JOIST-SUPPORTING STRUCTURE AND METHOD

Filed Sept. 21, 1961

3 Sheets-Sheet 1

Fig. 1.

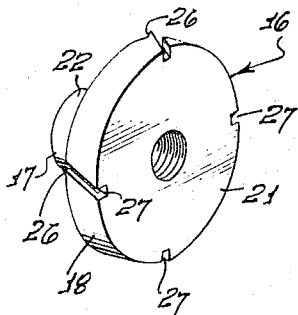


Fig. 2.

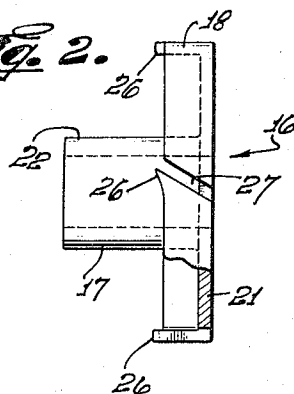


Fig. 3.

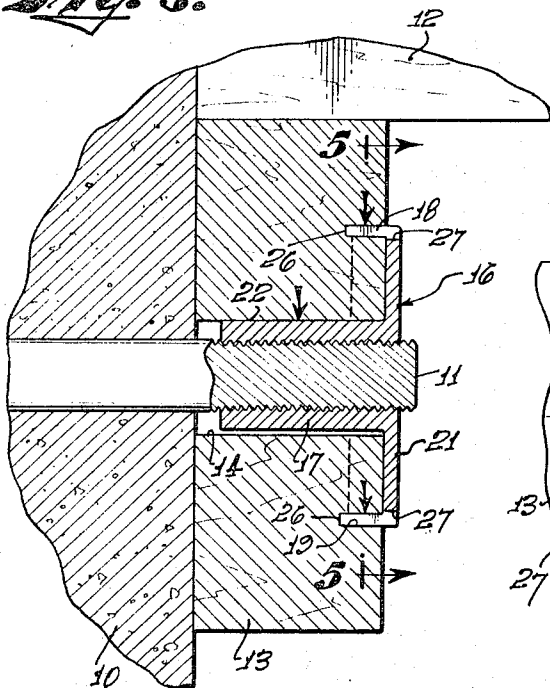


Fig. 4.

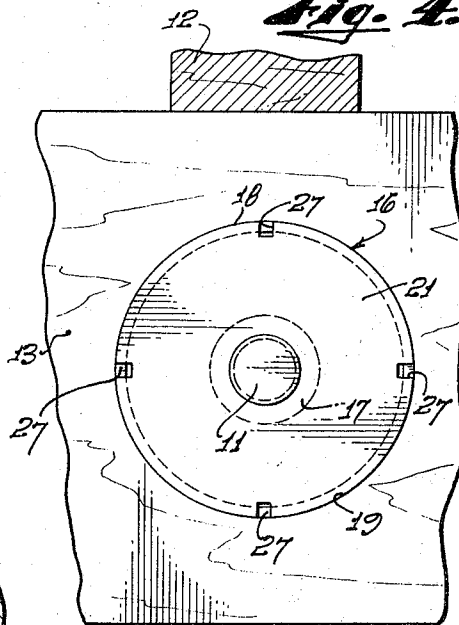
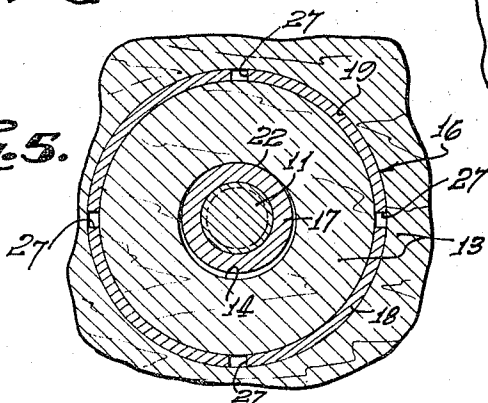


Fig. 5.



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3 Sheets-Sheet 3

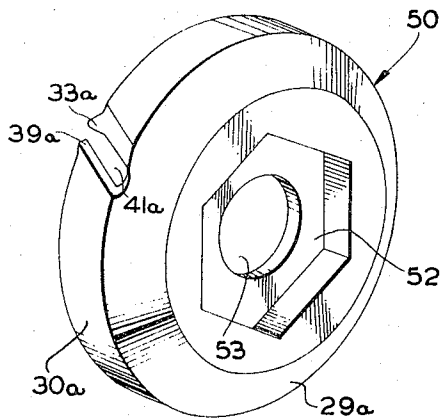


FIG. 13

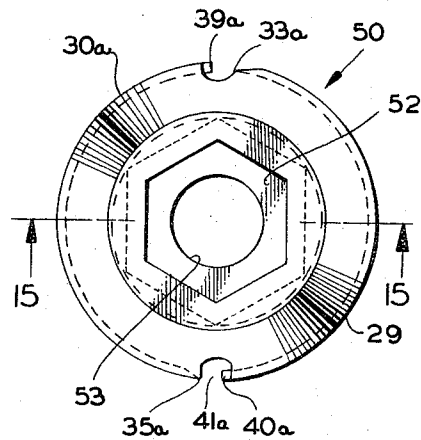


FIG. 14

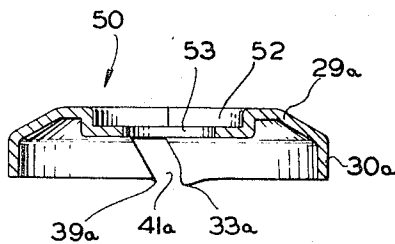


FIG. 15

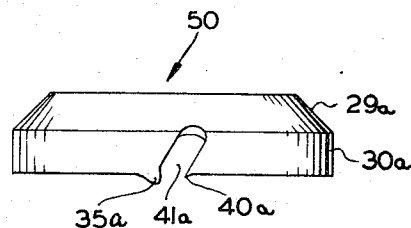


FIG. 16

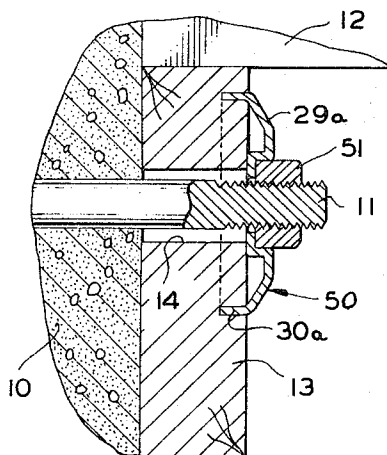


FIG. 17

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3,305,987
**JOIST-SUPPORTING STRUCTURE
AND METHOD**
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Filed Sept. 21, 1961, Ser. No. 140,185
23 Claims. (Cl. 52—283)

This application is a continuation-in-part of my copending patent application Serial No. 36,465, filed June 14, 1960, now abandoned, which in turn is a continuation-in-part of my patent application Serial No. 667,488, filed June 24, 1957, now abandoned, for Joist Supporting Structure.

This invention relates to a structure and method for supporting beams or joists in buildings, and especially in buildings constructed of concrete. The invention additionally relates to shear nut elements for use in anchoring a beam or ledger on stud bolts projecting from a wall or floor.

During the erection of concrete buildings it is common practice to embed in the concrete walls horizontal rows of stud bolts, the latter being adapted to be inserted through holes in the horizontal wooden ledger beams which support the joists for the floors or roof of the building. With such an arrangement it is necessary to employ large numbers of stud bolts, located relatively close to each other, in order that the stress concentration at each bolt will not be so great as to effect cracking or splitting of the ledger. The stud bolts being expensive to purchase and use, it will be understood that the necessity of using large numbers of bolts adds materially to the cost of the building.

In addition to the above, it is pointed out that a substantial problem is faced by workmen who must properly mount a heavy beam or ledger over a plurality of stud bolts anchored in a concrete wall. The locations of such stud bolts are not perfectly accurate, and the beam is not conventionally provided with holes prior to the mounting operation. This being the case, the workmen may lift the heavy beam up to the outer ends of the stud bolts and, for example by striking the beam with a hammer, attempt to make marks on the beam corresponding to the locations of the ends of the bolts. Any resulting marks are necessarily imperfect, however, it not being known exactly where the centers of the bolts should lie. For this and other reasons, the resulting bores made in the beam will not be perfectly centered relative to the bolts.

In prior art constructions, in which the diameters of the bores were made only slightly larger than those of the bolts in an attempt to cause each bolt to bear its proportionate share of the load, the inherent eccentricity between the bolts and the bores frequently made it impossible for the workmen to mount the beam over the bolts after the bore were made. Thus, it was often necessary for the workmen to lift the heavy beam up to the bolts and (a) attempt to hammer it on, or (b) resort to the laborious process of attempting to find which bolts were off-center and then to reposition the bolts, as by bending them, or (c) enlarge the holes to such sizes that some would no longer bear load. The result was that even under the best of conditions encountered in the field, the loads borne by the bolts were very uneven, there being great loads imposed at some bolts and none at others, which resulted in the above-stated necessity for providing excessive numbers of bolts.

In view of the above factors characteristic of structures

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of the type indicated, it is an object of the present invention to provide a joist-supporting structure which requires only a relatively small number of stud bolts as compared to conventional constructions, yet which does not result in splitting or cracking of the ledgers upon which the floor joists are supported.

Another object of the invention is to provide a shear nut device and method adapted to facilitate greatly the mounting of a beam or ledger onto a plurality of projecting stud bolts, without the necessity of accurate measurement, yet resulting in a construction in which each bolt bears its proportionate share of the load and with greatly-reduced tendency to effect splitting or other damage to the beam or ledger.

A further object is to provide a joist-supporting structure adapted to be partially formed in place, the result being that variations in the locations of the stud bolts, and in the locations of the bolt holes in the ledgers, will not result in undesirable stress concentrations.

A further object is to provide a nut device having a load-supporting portion adapted to cut itself into the face of the beam, thereby greatly increasing the effective support area of the bolts with resultant reduction in the stresses tending to damage the beam.

A further object is to provide a shear nut having cutting teeth which will cut readily through wood and knots, and which will form grooves having unsplit cylindrical walls.

A further object is to provide a shear nut device having a load-supporting washer portion adapted to be associated with a conventional, mass-manufactured nut, so that the cost of the device is very low.

These and other objects and advantages of the invention will be more fully set forth in the following specification and claims, considered in connection with the attached drawings to which they relate.

In the drawings:

FIGURE 1 is an isometric view of a nut device constructed in accordance with a first embodiment of the invention;

FIGURE 2 is an enlarged side elevation of the nut of FIGURE 1;

FIGURE 3 is a fragmentary vertical sectional view illustrating the combination comprising a stud bolt, shear nut, and ledger adapted to support a floor joist;

FIGURE 4 is an elevational view of the showing of FIGURE 3, as viewed from the right side thereof;

FIGURE 5 is a vertical sectional view taken on line 5—5 of FIGURE 3, and looking outwardly as indicated by the arrows;

FIGURE 6 is a side elevation of a shear nut device constructed in accordance with a second embodiment of the invention;

FIGURE 7 is a bottom view of the device shown in FIGURE 6;

FIGURES 8 and 9 are sections taken respectively on lines 8—8 and 9—9 of FIGURE 7;

FIGURE 10 is a view illustrating the operation of the lead or scoring teeth in cutting concentric score lines in the face of the beam or ledger;

FIGURE 10a is an enlarged detail of a portion of FIGURE 10, but after a larger part of the groove has been formed;

FIGURE 11 is an enlarged fragmentary view illustrating the operation of the scooping teeth in scooping wood from between the score lines and discharging the wood through escape grooves in the nut device;

FIGURE 12 is an isometric view illustrating a section of a ledger and the associated stud bolts and shear nut devices;

FIGURE 13 is a perspective view of a shear washer constructed in accordance with a third embodiment of the invention, such washer being adapted to be associated with a conventional mass-manufactured nut;

FIGURE 14 is a plan view of the shear washer of FIGURE 13;

FIGURE 15 is section taken on line 15—15 of FIGURE 14, showing the teeth on one side of the washer;

FIGURE 16 is a side elevation showing the teeth on the other side of the washer, as viewed from the lower part of FIGURE 14; and

FIGURE 17 is an assembly view corresponding generally to the showing of FIGURE 3 but illustrating the shear washer of the third embodiment as associated with a conventional nut.

Referring to the drawings, and particularly to FIGURE 3, the invention is especially adapted for use in connection with a concrete wall 10 having a plurality of stud bolts 11 embedded therein and projecting perpendicularly therefrom. Only one stud bolt is illustrated in FIGURES 3—5, but it is to be understood that a substantial number of such bolts are provided (FIGURE 12) along the wall 10 and in a horizontal row. In conventional constructions, the stud bolts 11 are merely inserted through holes, of corresponding diameter, in a horizontal ledger beam adapted to support on its upper surface of the ends of the floor joists 12 for one story of the building being constructed. According to the present invention, however, the wooden ledger beam, indicated at 13, is provided with an oversized hole 14 adapted to receive the projecting portion of each stud bolt 11. Each hole 14 is also adapted to receive, as will be described in detail below, a portion of one embodiment of the nut device of the invention, which device has been given the reference numeral 16.

The nut device 16 comprises an internally-threaded body or nut portion 17, a load-bearing portion 18 spaced radially outwardly from the body 17 for insertion into a groove or recess 19 in the outer vertical face of ledger 13, and means 21 to connect the load-bearing portion 18 to body 17.

In the present embodiment, the body or nut portion 17 is formed as a relatively long cylindrical sleeve, the length being almost as great as the thickness of the ledger 13. The outer cylindrical surface 22 of body 17 has a diameter smaller than that of hole 14.

The load-bearing portion 18 comprises a hollow cylinder which is concentric with body 17 and is disposed a substantial distance radially outwardly from one end portion thereof. Load-bearing cylinder 18 is substantially shorter than body 17, and shorter than the diameter of cylinder 18, since it is adapted, as will be described subsequently, to embed itself in the face of ledger 13 by forming the groove or recess 19. The connecting means 21 preferably comprises a radially-extending flange which is continuous between the outer ends of body 17 and load-bearing means 18. Preferably, the entire nut device 16 is formed integral and of a suitable steel.

It is to be understood that the hollow cylinder 18 has interior and exterior cylindrical surfaces which are coaxial with the threaded opening in body 17. Such hollow cylinder has a sufficient dimension, axially of the device, that it will provide a large bearing area adapted to support load, such load being transmitted through the flange 21 to the body 17 and thus to the bolt 11. The groove or recess 19, which is concentric with the bolt 11 but not normally with the opening 14, has a sufficient depth to receive at least a substantial proportion, and preferably all, of the hollow cylinder 18.

In order to cut the groove or recess 19 in place, so that its location will be proper despite variations in the concentricity and positioning of stud bolts 11, etc., cutting tooth or chisel means are provided on the load-bearing

cylinder 18. These means comprise a plurality of teeth 26 formed at the rim of the cylinder 18, remote from flange 21, and inclined forwardly in order that threading of the nut device onto the stud bolt 11 will effect cutting of the groove 19. A slot or groove 27 is formed in load-bearing cylinder 18 immediately in advance of each cutting tooth 26, being open at both ends in order to provide a passage for chips cut from the ledger 13 during the groove-forming operation. Such slots incline rearwardly relative to the direction of rotation, obliquely to the axis of the nut device. The teeth 26 are formed by bending the metal of load-bearing cylinder 18 outwardly, at the forward end of each slot 27, to form a sharp and protruding chisel edge.

It is pointed out that the teeth 26 are adapted to form a groove 19 which will receive the hollow cylinder 18 in relatively snug-fitting relationship. Thus, the teeth should not be made substantially wider than the wall thickness of the hollow cylinder 18. The teeth cut a groove 19 having un-split cylindrical side walls capable of bearing large loads.

Operation of the embodiment of FIGURES 1—5

In the operation of the joist-supporting structure shown in FIGURES 1—5, a plurality of stud bolts 11 are embedded in the concrete wall 10 in a horizontal row, so that their threaded ends project horizontally. An oversized hole 14 is then bored in the ledger beam 13 for each stud bolt 11, and the ledger beam is mounted over the stud bolts and supported thereon. A nut device 16 is then partially threaded onto each projecting stud bolt 11, the arrangement being such that the inner (forward) portion of each nut body 17 is inserted part way into a corresponding hole 14. It will be understood that the ledger 13 may then rest on the upper portions of the outer cylindrical surfaces 22 of nut bodies 17, at least in the case of two or more of the nut devices 16 which are provided for each ledger 13.

A spanner wrench, which fits into the outer or rear ends of the slots 27, is then employed to rotate each nut device 16 additionally, and thus effect cutting of the grooves 19 by the teeth 26. Such rotating and cutting action is continued until the flange 21 abuts the outer face of ledger 13.

Because the grooves 19 are cut in place, the load-bearing portion 18 of each of the nut devices 16 fits substantially perfectly in each groove. The upper and outer semi-cylindrical portion of each load-bearing cylinder 18 therefore bears an equal load, regardless of variations in the elevations of the stud bolts 11, the positions of the holes 14, etc. This also applies to the lower and inner semi-cylindrical portion of each cylinder 18. This uniform load or stress spreading, coupled with the load-spreading operation resulting from the fact that the upper semi-cylindrical portion of each surface 22 provides (at least in the case of two stud bolts) a more widely distributed load-bearing action than does the stud bolt 11, means that the possibility of splitting the ledger at a stud will be very greatly reduced. It follows that only a much smaller number of studs 11, holes 14, etc., need to be employed than in the case of constructions in which no nut devices 16 are employed.

It is pointed out that it is impossible or impractical for a workman in the field to bore a large number of holes 14 concentrically with the stud bolts 11 to be respectively inserted therethrough: Thus, the various stud bolts 11 are, inherently, indeterminately eccentric or concentric to the holes 14 through which they extend.

Embodiment of FIGURES 6—12

Proceeding next to a description of the embodiment illustrated in FIGURES 6—12 of the drawings, the wall 10, ledger 13, stud bolts 11, holes 14 and grooves 19 have been numbered as in the previous embodiment. The nut device of the present embodiment comprises a body including a radially-extending portion 29, a load-bearing

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portion 30 on one side thereof, and a wrench-hold portion 31 on the other side thereof. The entire body may be formed integral, or the wrench-hold portion 31 may be a conventional nut which is suitably welded or otherwise rigidly secured to a generally cup-shaped steel member.

The radially-extending portion 29 corresponds generally to the flange 21 of the previous embodiment, and the load-bearing portion 30 corresponds generally to the hollow cylinder 18 of the previous embodiment. The center of the radially-extending portion 29 is formed with an opening, constituting an extension of internally-threaded opening 32 in the wrench-hold or nut portion 31. Load-bearing portion 30 (including its cylindrical inner and outer surfaces) is concentric with the internally-threaded opening 32.

The embodiment of FIGURES 6-12 is illustrated as incorporating cutting-tooth means which constitute an improvement on the means described with relation to the previous embodiment. Such cutting-tooth means comprise a first lead or score tooth 33 adapted to form a score line or cut 34 which is directly opposite the interior cylindrical surface of the load-bearing portion 30. A second lead or score tooth 35, illustrated as being diametrically opposite tooth 33, is adapted to form a second score line or cut 37 directly opposite the exterior cylindrical surface of load-bearing portion 30. The score lines or cut 34 and 37 are thus of different diameters, both being concentric with the internally-threaded opening 32.

Each score tooth 33 and 35 is illustrated as comprising an elongated sharp edge 38 which is arcuate (FIGURE 8) when viewed in elevation. Such teeth may be formed integrally with the load-bearing portion by a hammering or swaging operation. The outer-most portions of the sharp edges 38 are disposed relatively remote from the rim of load-bearing portion 30, so that they contact the face of the beam or ledger 13 before such face is contacted by scooping teeth 39 and 40 which correspond to the teeth 26 described with relation to the previous embodiment. Stated otherwise, the center portions of the edges 38 are axially in advance of or leading the scooping teeth 39 and 40. Grooves or slots 41 are provided adjacent the respective scoop teeth 39 and 40 to permit discharge of shavings or chips therethrough, and correspond to the grooves or slots 27 of the previous embodiment.

Operation of the embodiment of FIGURES 6-12

Except as will be indicated, the operation of the present embodiment is the same as was described with relation to the previous one. Preparatory to mounting the ledger 13, oversize holes 14 are bored at locations corresponding generally to the locations of stud bolts 11. Such holes 14 are so large that their locations may be determined without precision, in some instances even by eye. Since the holes 14 are large, it is an extremely simple matter for the workman to lift the ledger 13 and support it on the bolts 11 which are extended through the openings 14.

The ledger 13 is merely allowed to rest on the stud bolts 11, or else is suitably leveled. A shear nut device is then threaded onto the projecting end of each stud bolt 11, it being pointed out that in this embodiment the stud bolts are made at least sufficiently long to extend well beyond the outer surface of the ledger 13. A conventional crescent wrench is then employed to grasp wrench-hold portion 31 of each nut device and rotate the device until the annular grooves 19 are formed, and the load-bearing portions 30 of all nut devices are seated in such annular grooves.

Because of the particular construction of the teeth 33, 35, 39 and 40, rotation of the nut devices is effected without substantial effort. Furthermore, such teeth cut readily through the wood, even if knots are encountered. The sharp cutting edges 38 of the score teeth 33 and 35 form the score or lead cuts 34 and 37, following which the scooping teeth 39 and 40 remove the wood from between the cuts. This process is continued while the rota-

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tion of the nut on the stud bolt effects drawing of the nut inwardly due to the threaded relationship therebetween. As in the case of the previous embodiment, the resulting chips discharge through the grooves or slots 41.

Embodiment of FIGURES 13-17

In the embodiment of FIGURES 13-17, substantial manufacturing economies are effected by manufacturing the shear nut device in two pieces, namely a shear washer 50 and an associated nut 51. The washer 50 has a central portion which is hexagonally recessed at 52 to receive the leading or bottom portion of the conventional, mass-manufactured nut 51.

The peripheral portions of the washer 50 corresponds to the previously-described radial portion 29 and load-bearing portion 30 of the previous embodiment, being numbered 29a and 30a. In the present embodiment, however, the respective score teeth are disposed adjacent the respective scooping teeth, on opposite sides of slots 41a therefrom. Thus, the outer score tooth 35a is coined at the corner on the opposite side of a slot 41a from the first scooping tooth 40a. Correspondingly, the inner score tooth 33a is coined opposite the second scooping tooth 39a.

Such score teeth are, as in the previous embodiment, respectively flush with the outer and inner cylindrical surfaces of load-bearing portion 30a. They therefore cut concentric circles between which wood is removed due to subsequent operation of the scooping teeth. The score teeth lead, or are axially in advance of, the scooping teeth in order that the concentric circles will be cut before the scooping teeth commence to operate.

Referring particularly to FIGURE 17, the wall of the hexagonal recess 52 provides a driving and load-bearing connection between the shear washer 50 and nut 51. Thus, it is merely necessary to mount the washer 50 on the projecting end of bolt 11 and then thread the nut on the bolt. Before the washer contacts the ledger 13, the washer is moved outwardly so that its recess 52 receives the forward portion of the nut. The nut is then rotated with a conventional wrench, and drives the washer to form the annular groove as described relative to the previous embodiment.

The hole 53 which is provided at the center of washer 50 may be oversize, so that it will not bind on the threads of the bolt. The load is absorbed by the nut 51 due to seating of the recess wall thereon.

It is to be understood that all of the appended claims which recite the nut, threaded body, etc., apply equally well to constructions in which the nut and other portions are integral (as in the previous embodiment), are welded or otherwise permanently connected, or are in several pieces and associated with each other as by the bolt 11 (for example, similarly to the present embodiment). Thus, for example, the fact that a claim recites a flanged body as being threaded does not exclude constructions such as shown in FIGURES 13-17 from the scope of such claim. Since the nut 51 is rigidly associated with washer 50, due to operation of bolt 11, the nut and washer may both be regarded as the same "body," "threaded element," etc.

It is pointed out that the present invention may be employed not only in conjunction with ledgers 13, but also in connection with other beams and the like. For example, the nuts may be employed to bolt sole plates to foundations at plywood shear panels.

Various embodiments of the present invention, in addition to what has been illustrated and described in detail, may be employed without departing from the scope of the accompanying claims.

I claim:

1. A joist-supporting structure; which comprises a plurality of stud bolts anchored in a wall element; a wooden ledger having apertures corresponding in location to said stud bolts and mounted over said stud bolts so that the

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latter are inserted into said apertures, said apertures being substantially larger in diameter than said stud bolts; and a plurality of nut devices mounted one on each of said stud bolts, said nut devices each comprising an internally-threaded body threaded onto a stud bolt, said body having a load-bearing portion adapted to bear against a side wall of a circular groove or recess formed in said ledger concentrically with said stud bolt, and means on said load-bearing portion to form said groove or recess in said ledger in response to rotation of said load-bearing portion resulting from threading of said body onto said stud bolt.

2. The invention as claimed in claim 1, in which each of said load-bearing portions comprises a hollow cylinder having inner and outer cylindrical surfaces concentric with said stud bolt, and in which said last-named means comprises cutting teeth formed on an edge of said cylinder and adapted to cut said groove with concentric cylindrical side walls disposed to receive snugly between them said cylindrical surfaces.

3. A nut device for threading onto a bolt extending through a hole in a wooden member, which device comprises an internally-threaded nut-like body having a radial flange, said body having internal threads mating with those on said bolt, a short hollow load-bearing cylinder rigidly provided on said flange outwardly from said body, said cylinder being coaxial with said body, and means on said cylinder to form in the face of said wooden member in response to rotation of said body caused by threading of said body onto said bolt an annular groove having such depth and size as to receive snugly at least a substantial portion of said cylinder.

4. The invention as claimed in claim 3, in which said hollow cylinder has concentric cylindrical surfaces coaxial with said body, and in which said last-named means comprises at least one cutting tooth provided on the edge of said cylinder remote from said flange and directed forwardly relative to the direction of rotation of the nut device during threading thereof onto said bolt, said tooth being shaped to cut a groove the width of which corresponds to the radial distance between said concentric surfaces.

5. The invention as claimed in claim 4, in which a groove is formed in said cylinder at said tooth and oblique to the axis of said nut device, said groove being disposed to receive and provide a passage for chips cut from said wooden member by said tooth in forming said annular groove.

6. A nut device adapted to secure a wooden ledger beam onto a stud bolt projecting from a wall element, which comprises an elongated cylindrical body having a longitudinal passage formed axially thereof, said passage being internally threaded for threading of said nut device onto said stud bolt, a radial flange provided coaxially at one end portion of said body and non-rotatably associated therewith, a hollow cylinder formed integrally on the peripheral portion of said flange and radially outwardly from said body, said hollow cylinder being concentric with said body, said hollow cylinder having an axial dimension less than the diameter thereof, a plurality of teeth formed at spaced intervals on the edge of said hollow cylinder remote from said flange, and grooves formed in said hollow cylinder adjacent at least some of said teeth to receive shavings cut from said ledger by said teeth.

7. An assembly for incorporation on a building, which comprises a plurality of stud bolts mounted generally in a row, a wooden beam or board having a plurality of holes formed therein and located in general correspondence to the locations of said stud bolts, said holes each having a diameter substantially larger than that of the corresponding bolt in order to greatly facilitate mounting of said beam over said bolts, said beam being mounted on said bolts with said bolts extending through said holes, said beam being formed on its face adjacent the project-

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ing ends of said bolts with a plurality of annular grooves each of which is concentric with the associated bolt, each of said grooves having a diameter substantially larger than that of the associated hole, an internally-threaded body threaded over the projecting end of each of said bolts, each body having a portion inserted a substantial distance into each of said annular grooves, and cutting means on each of said bodies to form the associated annular groove in said beam in response to rotation of said cutting means caused by threading of said body onto the associated bolt.

8. A load-bearing device, which comprises a threaded element, said element having a short and relatively large-diameter load-bearing portion coaxial with the threads of said element, the axial dimension of said portion being less than the diameter thereof, and cutting tooth means connected to said element and adapted to form a circular groove or recess in a wooden member in response to rotational movement of said cutting tooth means caused by threading of said element relative to an associated threaded support, said cutting tooth means and said load-bearing portion being so related that said load-bearing portion automatically inserts itself a substantial distance into said groove or recess due to threading of said element onto said associated threaded support and upon cutting of said groove or recess by said cutting tooth means.

9. A load-bearing nut device, which comprises a body formed of metal and having an internally-threaded opening therein, a strong hollow load-bearing cylinder formed of metal and having a relatively large diameter, the axial dimension of said cylinder being less than the diameter thereof, said cylinder being rigidly associated with said body and having inner and outer cylindrical walls coaxial with said opening, and cutting tooth means provided on one edge of said cylinder to form an annular groove in a plank or board in response to threading of said body onto a correspondingly externally-threaded member, said cutting tooth means being adapted to form said groove with cylindrical walls adapted to receive snugly between them said inner and outer cylinder walls, said cylinder having a sufficient axial dimension to permit insertion thereof a substantial distance into said annular groove.

10. A load-bearing nut device, which comprises an internally-threaded body formed of metal, a strong hollow cylinder formed of metal and having a substantial dimension axially of said body, means to connect said body to said cylinder in strong and rigid coaxial relationship, a plurality of cutting teeth formed on one end of said cylinder to cut an annular groove in a plank or board in response to threading of said body onto a corresponding externally threaded member, and means associated with said cutting teeth to remove cuttings from said groove.

11. A method of mounting an elongated wooden board or beam over a row of projecting elements which are anchored in a wall, floor or ceiling of a building, which method comprises forming a plurality of bores in said board or beam corresponding approximately in location to the locations of said projecting elements but having diameters substantially larger than the diameters of said elements whereby to facilitate mounting of said board or beam over said elements, thereafter mounting said board or beam over said elements with each bore receiving one of said elements, thereafter forming in said board or beam an annular groove in outwardly spaced relation from each of said bores and concentric with the element therein, said grooves being on a face of said board or beam which is remote from said wall, said last-named step being such that each of said annular grooves has sufficient size and depth to form substantially cylindrical load-bearing surfaces concentric with the associated element, inserting strong load-bearing means snugly into said annular grooves, and maintaining said load-bearing means inserted in said grooves and rigidly and strongly connected with said projecting elements independently

of said board or beam, whereby forces exerted between said load-bearing surfaces and said load-bearing means are transmitted directly to the associated elements regardless of the eccentricity or concentricity of said bores and of the oversize nature thereof.

12. The invention as claimed in claim 11, in which said method includes employing said projecting elements as centering means during formation of said annular grooves.

13. The invention as claimed in claim 12, in which said method includes providing teeth on the leading edges of said load-bearing means, and forming said grooves by rotating said load-bearing means about said projecting elements.

14. A shear nut device for mounting on a bolt extending through a hole in a wooden board or beam, which comprises a body having an internally-threaded opening adapted to receive the threads of said bolt, said body extending a substantial distance radially from said opening, wrench-hold means provided on said body on one side thereof to permit rotation of said body by means of a wrench to thread the same onto said bolt, load-bearing means provided on said body on the opposite side thereof from said wrench-hold means and adapted to be inserted into a circular groove or recess formed in said board or beam concentrically with said bolt and having a substantially larger diameter than said hole, the axial dimension of said load-bearing means being less than the diameter thereof, and cutting-tooth means provided on said load-bearing means to effect cutting of said groove or recess in said board or beam in response to rotation of said load-bearing means caused by threading of said body onto said bolt.

15. The invention as claimed in claim 14, in which said wrench-hold means has a substantially smaller diameter than that of said body, and in which said load-bearing means comprises a hollow cylinder having concentric cylindrical surfaces coaxial with said opening.

16. The invention as claimed in claim 15, in which said cutting-tooth means comprises score-tooth means to form in the face of said board or beam first and second circular score cuts concentric with said opening and having different diameters, and a scooping tooth adapted to scoop out the wood from between said score cuts, said scooping tooth being adapted to engage said board or beam subsequent to engagement thereof by said score-tooth means upon threading of said body onto said bolt, said cutting tooth means being disposed to cut cylindrical groove walls in said board or beam, the diameters and locations of said walls corresponding, respectively, to said cylindrical surfaces.

17. A nut device for threading onto a bolt extending through a hole in a beam, comprising a body having an internally-threaded opening therein adapted to receive said bolt, said body having a portion adapted to be inserted into an annular groove formed in said beam concentrically with said opening, and cutting-tooth means formed on said portion of said body to create said annular groove in response to threading of said body onto said bolt, said cutting-tooth means comprising a first scoring tooth adapted to form in said beam an annular cut concentric with said opening and having a first diameter, a second scoring tooth adapted to form in said beam an annular cut concentric with said opening and having a second diameter, and a third tooth adapted to scoop wood from between said first and second annular cuts, said last-mentioned tooth being disposed axially to the rear of said first and second teeth whereby scooping is not effected until after scoring of said beam by said first and second teeth.

18. The invention as claimed in claim 17, in which means are provided adjacent said third tooth to permit discharge of shavings through said portion of said body adapted to be inserted into said annular groove.

19. A shear nut for threading on a stud bolt extending through an oversize hole in a beam or ledger, which

comprises a strong metal disc having a central opening therein adapted to receive said bolt, nut means provided on said disc on one side thereof and having flats for reception of a wrench, said nut means having an internally-threaded opening concentric with said disc and adapted to threadedly receive said bolt, a hollow cylinder having inner and outer cylindrical surfaces and rigidly associated with the peripheral portion of said disc, said surfaces being concentric with said internally-threaded opening, said hollow cylinder having a sufficient dimension axially of said internally-threaded opening for insertion to a substantial depth in an annular groove in said beam, and cutting-tooth means provided on the edge of said hollow cylinder remote from said disc and adapted in response to rotation of said hollow cylinder to form in said beam an annular groove of such size to receive at least a substantial portion of said hollow cylinder in snug relationship.

20. The invention as claimed in claim 19, in which said cutting-tooth means comprises a first scoring tooth adapted to form in said beam an annular cut concentric with said opening and having a first diameter, a second scoring tooth adapted to form in said beam an annular cut concentric with said opening and having a second diameter, and a third tooth adapted to scoop wood from between said first and second annular cuts.

21. A load-bearing device, comprising a shear washer having a relatively large-diameter load-bearing portion shaped as at least a substantial part of a hollow cylinder, cutting-tooth means provided on said load-bearing portion and adapted to form a circular groove or recess in a wooden member in response to rotation of said washer about its axis, threaded means separate from said shear washer, and means to drivingly associate said threaded means with said washer to rotate the same about said axis in response to threading of said threaded means onto an associated threaded support element, said cutting-tooth means and load-bearing portion being so related that said load-bearing portion automatically inserts itself a substantial distance into said groove or recess due to threading of said threaded means relative to said threaded support element and upon cutting of said groove or recess by said cutting-tooth means.

22. The invention as claimed in claim 21, in which said threaded means is a nut having at least one flat side, and in which said means to drivingly associate said nut with said washer includes the wall of a recess formed in said washer, said recess receiving a part of said nut in relatively close-fitting relationship, said recess wall serving to transmit load from said load-bearing portion to said nut and thus to said threaded support, said threaded support comprising a bolt on which said nut is threaded.

23. A joist-supporting structure, which comprises a plurality of elements anchored in a wall; a wooden ledger having apertures therein only approximately corresponding in location to said elements, said ledger being mounted over said elements so that the latter are inserted through said apertures, said apertures being much larger in diameter than said elements so that said mounted condition may be achieved despite the approximate locations of said apertures, the face of said ledger which is remote from said wall having formed therein around each of said apertures an annular groove, each of said grooves being precisely concentric with the element therethrough and having a diameter much larger than the associated aperture, the side walls of each of said grooves being cylindrical about the axis of the associated element, a hollow cylinder inserted snugly into each of said grooves and in surface engagement with each of the cylindrical walls thereof, and means to maintain each of said hollow cylinders rigidly connected to the associated element and inserted into the associated groove.

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