(12) STANDARD PATENT APPLICATION (11) Application No. **AU 2003200565 A1**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Suspended jig for roof construction

(51)[7] International Patent Classification(s)
E04G 021/00

(21) Application No: **2003200565** (22) Date of Filing: **2003.02.19**

(30) Priority Data

(31) Number	(32) Date	(33) Country
10/119418	**2002.04.09**	**US**

(43) Publication Date: **2003.10.30**
(43) Publication Journal Date: **2003.10.30**

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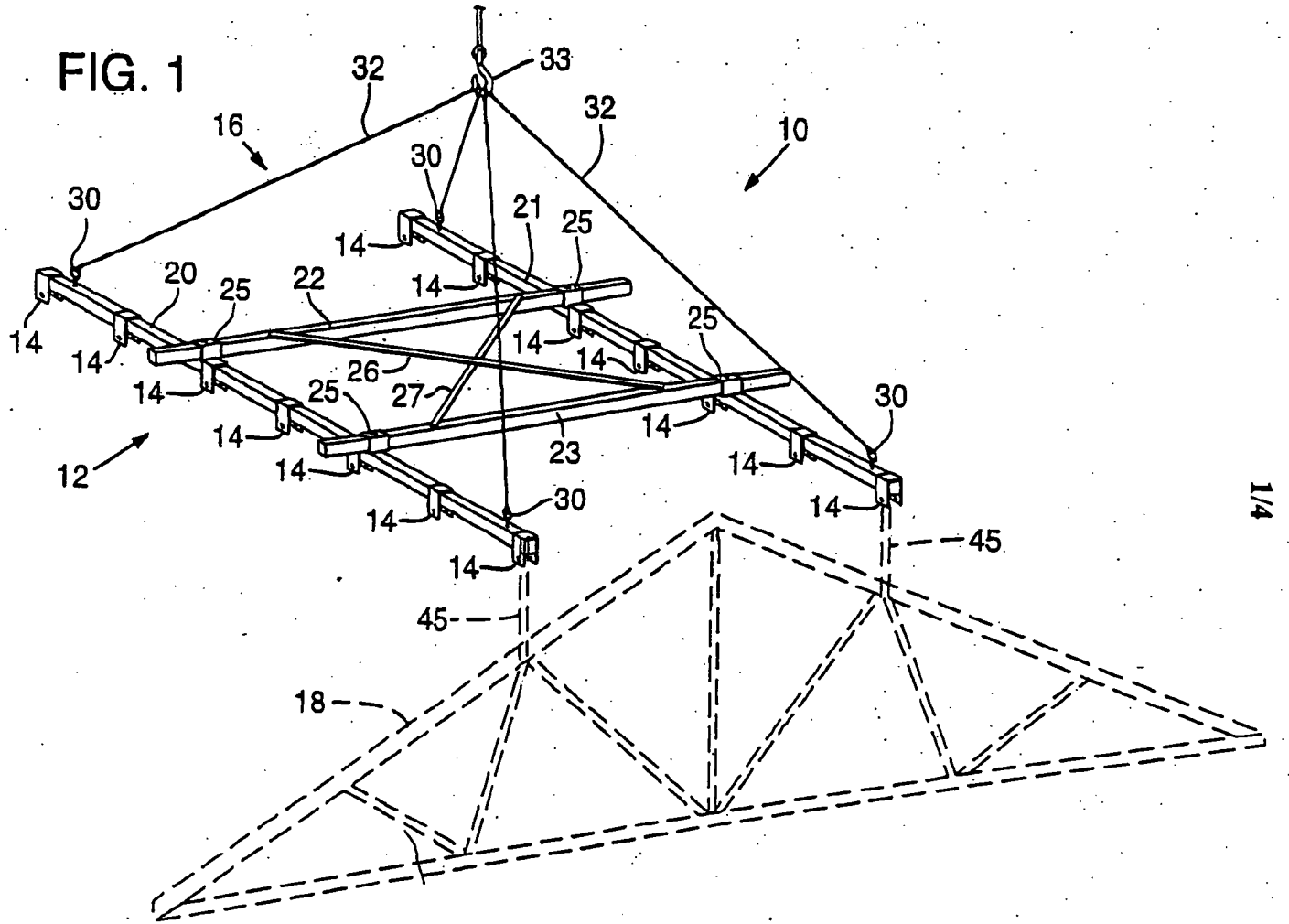
Abstract of the Disclosure

A roof framing jig for suspending a plurality of individual roof trusses in a predetermined spacing and orientation so as to facilitate construction of a roof truss assembly. The roof framing jig includes a jig frame, a hoist connection for suspending the jig frame, and a plurality of truss supports secured to the jig frame, where each truss support is adapted to suspend an individual roof truss.

FIG. 1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AUSTRALIA

Patents Act

COMPLETE SPECIFICATION
(ORIGINAL)

Class Int. Class

Application Number:
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority

Related Art:

Name of Applicant:

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Invention Title:

SUSPENDED JIG FOR ROOF CONSTRUCTION

Our Ref : 688023
POF Code: 19671/19671

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

SUSPENDED JIG FOR ROOF CONSTRUCTION

Field of the Invention

The present invention relates to a method and apparatus for forming roof truss assemblies during roof construction.

Background of the Invention

A roof frame must be able to support not only the gravity load of the roof itself, but also need to withstand additional loads due to construction, snow, wind, and earthquake. In most current construction the roof is supported by a roof truss framework. The use of roof trusses offer several advantages to a builder, including enhanced strength, greater economy (as trusses use both fewer and shorter lengths of lumber than alternative roof framing), and the availability of a variety of different truss shapes and styles, including custom truss designs. In addition, the use of a roof truss frame permits greater

flexibility in the layout of the building interior, as the truss frame typically transfers the entire roof load to the exterior walls.

However, the use of trusses in roof construction presents disadvantages as well. Although many types of trusses are commercially available and preassembled, the trusses must still be raised to roof level and assembled into the roof frame. Truss assembly typically requires construction at well above ground level, and therefore brings with it the hazards and problems associated with working at such a height. Even beyond the risks due to falling, framing and sheathing a roof requires accuracy and precision, which can be made more difficult to achieve when working at a significant height.

It would be safer to assemble a desired roof frame at ground level and then raise the entire assembly into the desired position. However, many job sites lack an appropriately sized and sufficiently level location to permit accurate truss framework assembly. The necessary leveling and alignment of truss members is difficult to achieve at ground level as it ideally requires that each truss should be rendered plumb and level before incorporation into the truss framework. Unfortunately errors in assembling the truss framework may not be discovered until the completed framework is hoisted into position on top of the supporting walls. Making the necessary repairs or corrections once the truss assembly is in place at height is at least awkward, and may be dangerous.

Summary of the Invention

The invention provides a roof framing jig and a method of using the roof framing jig to assemble a roof truss assembly. The roof framing jig includes a jig frame, a hoist connection for suspending the jig frame, and a plurality of truss supports secured to the jig frame, where each truss support is adapted to suspend an individual roof truss. The jig is configured to suspend a plurality of individual roof trusses in a predetermined spacing and orientation to facilitate construction of a truss assembly. The method aspect of the invention positions a roof framing jig that includes a jig frame, a hoist connection adapted for suspending the jig frame, and a plurality of truss supports secured to the jig frame. Each truss support is adapted to suspend an individual roof truss. The next step is to suspend at least two individual roof trusses from at least two truss supports, with the jig being

configured such that the individual roof trusses are suspended in a predetermined spacing and orientation. The roof trusses are then braced to form a truss assembly.

Brief Description of the Drawings

Figure 1 is a schematic isometric view of a roof truss jig according to one aspect of the present invention.

Figure 2 is a front view of a horizontal beam of the roof truss jig of Figure 1.

Figure 3 is a partial schematic isometric view of the roof truss jig of Figure 1, showing details of a truss support.

Figure 4 is a schematic view of a truss assembly suspended from the roof truss jig of Figure 1.

Figure 5 is a schematic view showing a sheathed truss assembly being hoisted into place on a building frame.

Detailed Description of the Preferred Embodiment

Fig. 1 shows a roof truss jig 10, constructed in accordance with an illustrated aspect of the present invention. The roof truss jig 10 includes a jig frame 12, a plurality of truss supports 14, and a hoist connection 16. Roof truss jig 10 is configured so that when a preassembled roof truss 18 is suspended from jig frame 12, the roof truss can hang horizontally level and vertically plumb with a desired truss spacing. The roof trusses may be subsequently braced and/or sheathed to form a truss assembly.

Roof Truss Jig

Jig frame 12 may include one or more beams, which may be horizontal beams, such as beams 20 and 21 as shown in Figure 1. The jig frame beams serve as attachment points for a plurality of truss supports 14. Generally, the number of truss supports that may be supported by a given beam is dependent upon the length of the beam and the desired spacing between trusses. Preferably, truss supports 14 are adjustably supported by beams 20 and 21, so that the spacing between individual truss supports may be varied.

Horizontal beams 20 and 21 may be coupled to, and suspended from, beams 22 and 23 by one or more beam couplings 25. Beam couplings 25 may be fixed couplings or adjustable couplings. Where the beam couplings are adjustable, the spacing between beams 20 and 21 may be altered to accommodate a variety of truss sizes. Adjustable beam couplings may incorporate bolts that are inserted into predrilled holes or slots in beams 20 and 21, beams 22 and 23, or both. The predrilled holes or slots, when present, typically correspond to one or more preselected fixed spacings between beams 20 and 21. Typically, the preselected spacings would be chosen so that the resulting configuration of the jig frame is symmetrical about the center of the frame, to increase stability and balanced loading of the frame. Jig frame 12 may include adjustable beam couplings so that the roof truss jig of the invention may be partially dismantled to facilitate transport of the jig to a work site. Alternatively, beam couplings 25 are fixed couplings, such as may be obtained by welding or otherwise permanently joining beams 20 and 21 to beams 22 and 23, in order to obtain enhanced strength and stiffness

under load. Beam coupling 25 may be fixed to horizontal beam 20 or 21, and also adjustably fixed to beam 22 or 23. Beam couplings 25 may be manufactured from 4″ × 4″ × 3/8″ × 6″ square steel tubing, among other suitable materials.

Beams 20, 21, 22, and 23 may be manufactured from any suitable material having the necessary strength and resilience to withstand the loads required during use. One such material is steel, particularly steel tubing, although a variety of other materials may be used. Where beams 20, 21, 22, and 23 are manufactured from steel tubing, the steel tubing may be 3″ × 3″ × 3/16″ square steel tubing.

Jig frame 12 may also include diagonal bracing straps 26 and 27 between beams 22 and 23. Straps 26 and 27 may reinforce the rigidity of the jig frame, and help maintain beams 22 and 23 (and therefore beams 20 and 21) in a parallel relationship. Straps 26 and 27 may be prepared from 2″ × ¼″ steel straps, among a variety of suitable materials.

Roof truss jig 10 further includes a hoist connection 16 that is utilized to raise the entire jig above the ground, and may include any fixture or feature that facilitates hoisting jig frame 12. In the illustrated roof truss jig of Figures 1-5, hoist connection 16 includes four eyebolts 30, attached to beams 22 and 23 so as to define the corners of a rectangle. Hoist connection 16 further includes cabling 32, configured to suspend eyebolts 30 from a common hook or connection 33 that serves to lift the jig. Typically, a crane or hoist is used to lift the jig using a hook or ball connection. Although a greater or lesser number of connection points to the jig frame may be used to hoist the jig without departing from the scope of the invention, the use of four connection points in a rectangular array offers significant

advantages with respect to stabilizing the load being hoisted, and so is a preferred configuration. The connection points are preferably symmetrically disposed about the center of jig frame 12, to increase stability and facilitate balanced loading of the jig frame.

A plurality of truss supports 14 are disposed on horizontal beams 20 and 21. The truss supports of the invention serve to suspend individual roof trusses from jig frame 12 with a predetermined spacing and orientation. Any suitable means of suspending a roof truss from one of beams 20 and 21 is a suitable truss support for the purposes of the invention. In the roof truss jig of Figures 1-5, truss supports 14 are disposed on and coupled to beams 20 and 21. As shown in more detail in Figure 3, truss support 14 includes bracket 34 having the shape of an inverted U that is disposed on beam 20. It should be understood that a plurality of such truss supports may be disposed on either beam 20, beam 21, or preferably both beam 20 and beam 21. Truss support bracket 34 may be manufactured from 4″ × 1/8″ steel strap, among a variety of suitable materials.

Referring to Figure 3, bracket 34 may be held at a preselected position on beam 20 by a retaining bolt 36. Where it is desired to change the spacing and orientation of the roof trusses suspended from the jig of the invention, the particular position of bracket 34 may be changed by removing bolt 36, aligning bracket 34 with a different predrilled hole 38 on beam 20, and inserting and tightening bolt 36. The predrilled holes on beams 20 and 21 corresponding to the preselected positions for truss supports 14 are typically symmetrically disposed with respect to the center of the beam, so as to increase stability and balanced

loading of the jig. Any spacing between truss supports that is consistent with the requirements of roof truss assembly construction is an appropriate truss support spacing. Typically, the truss supports are spaced so as to have a distance of approximately two feet between centerpoints of adjacent truss supports. Typically, a given roof truss is suspended from two truss supports disposed on beams 20 and 21, respectively.

The roof truss jig of the invention is generally configured to suspend a plurality of roof trusses. Typically, the roof truss jig includes sufficient truss supports to suspend 5 or more roof trusses. The roof truss jig may include sufficient truss supports to suspend 7 roof trusses at a preselected spacing of two feet on center. Additionally, or in the alternative, the size of a particular desired truss assembly may not require the entire capacity of the truss jig, leaving selected truss supports empty during construction of the truss assembly.

Truss support 14 further includes a pin 40 inserted into matching apertures in flanges 42 and 43 that form the sides of bracket 34. Pin 40 is configured to span the open end of the U of bracket 34 so that it is securely retained by the bracket. For example, pin 40 may incorporate a threaded segment that engages a threaded receiver in extension 43. Alternatively, a cotter pin, locking bolt, or other suitable retention means may be attached to the nose of pin 40 after it is inserted through extension 43, to hold the pin in place. Typically, pin 40 supports and anchors a coupling 45 that depends from bracket 34, where the coupling is used to suspend a roof truss from truss support 14.

Coupling 45 may have a fixed or variable length, however it is preferred that the length of coupling 45 be sufficient that a desired roof truss may be suspended from jig frame 12 without contacting the jig frame. The coupling may incorporate one or more of a hook, a solid bar, a chain, a rope, a strap, or any other suitable means with the strength and resiliency required to suspend a desired roof truss from bracket 34. As illustrated in Figure 3, coupling 45 may include a snap hook 46 depending from pin 40, that in turn supports a strap of flat webbing 48, such as nylon webbing or polypropylene webbing. Synthetic webbing is strong, abrasion resistant, and highly flexible, and is well suited for use as a coupling according to the invention. Snap hook 46 may be fastened to and depend from pin 40 by inserting the pin through an eyelet 47 of hook 46. Webbing 48, in turn, may be fastened to and depend from hook 46 by inserting the hook through a loop 50 of webbing 48, where the loop is formed, for example, by durable stitching 52 of the webbing.

The free end of webbing 48 may be tied around a truss member of a roof truss in order to suspend the truss from the jig. Alternatively, any suitable hook, loop, or buckle may be used to secure the roof truss, such as, for example, a cam buckle or a ratchet buckle.

Roof Construction using the Roof Truss Jig

A roof truss framework, optionally including roof sheathing, may be rapidly and safely constructed using the roof truss jig of the present invention. Typically, roof truss jig 10 is assembled at the desired work site, with the spacing between

beams 20 and 21, and the spacing between truss supports 14 selected so as to accommodate the particular roof trusses to be used in the roof construction. The roof truss jig is hoisted into the air using hoist connection 16, and suspended above a work surface at a height sufficient that a roof truss can be freely suspended from the truss jig, yet remain accessible from the work surface, as shown in Figure 4. Although the work surface is typically at or near ground level, the truss jig of the invention may also be used to facilitate construction of a roof truss assembly at a work surface above ground level, such as on an elevated platform.

A plurality of roof trusses 54 is suspended from the truss supports of roof truss jig 10, so that the individual roof trusses have a predetermined spacing and orientation. Typically, each individual roof truss is suspended so that is substantially vertically plumb and substantially horizontally level, and each of the roof trusses is suspended so that it is substantially aligned with each other roof truss.

Upon suspending and aligning the roof trusses from the roof truss jig, the roof trusses are then braced to form a roof truss assembly. Bracing the roof trusses includes fastening lateral bracing 56 between individual trusses as needed to create a truss assembly of sufficient strength and structural integrity for use in the desired roof construction. The lateral bracing optionally includes alignment bracing, where the alignment bracing is attached to the roof trusses either temporarily or permanently to facilitate alignment of the trusses during construction of the truss assembly.

The truss assembly may be partially or completely sheathed while suspended from the roof truss jig. Typically, roof sheathing 58 is installed on the truss assembly up to the point of attachment of the truss support coupling 45. At this point the partially sheathed truss assembly has sufficient structural integrity that it may be lowered to rest on the ground, and the roof truss jig disconnected from the truss assembly so that the remaining roof sheathing can be installed.

While the sheathing of a first roof truss assembly is being completed, it is particularly advantageous to move the roof truss jig to another portion of the worksite, suspended above the work surface, so that a second truss assembly may be constructed. When the second truss assembly has been partially sheathed and similarly lowered to the ground, the roof truss jig is disconnected, and then used to hoist the now fully sheathed first truss assembly 60 into a desired position on a building frame 62, as shown in Figure 5. The roof truss jig may then return to the fully sheathed second truss assembly and hoist it, in turn, to its desired position. This process represents a particularly efficient use of the roof truss jig of the invention, as the truss jig is in nearly constant use during construction of the roof.

When the roof truss jig is utilized to hoist a completed truss assembly into position, the truss jig may be reattached to each roof truss at the same points used during the initial suspension of the trusses. This may require creating an aperture in the sheathing above the desired attachment point so that coupling 45 can be attached to the truss. Where the truss assembly is not fully sheathed, either to facilitate attachment of the truss jig, or because the truss assembly represents only

a portion of the finished roof, reattachment of the truss jig may not require formation of an aperture in the sheathing.

Alternatively, the roof truss jig may be used to hoist the truss assembly by attaching the truss jig at less than every original attachment point. For example, a sheathed truss assembly may only be connected to roof truss jig 10 at four points, typically corresponding to two attachment points on each of two trusses, typically trusses set in from the edges of the truss assembly, more typically, the second truss in from each edge of the truss assembly. The additional stress on the truss assembly during hoisting may be mitigated by using a spreader bar (not shown) to reinforce the truss used as an attachment point. In particular, a spreader bar may be placed against the bottom edge of the top chord of the roof truss, perpendicular to the span of the truss. When the roof truss jig is attached to the truss, coupling 45 is wrapped around both the truss and the spreader bar.

Through the careful selection of the particular size and configuration of truss jig used, the roof truss jig of the invention may be useful in the construction of any type of trussed roof construction. Although particularly useful for construction of a gable roof, flat roofs, pitched roofs, wood framed roofs, and metal framed roofs may all be framed using the roof truss jig of the invention. The roof truss jig is suitable for use in both residential and commercial construction applications, although the load requirements of the truss jig may be more severe for commercial applications. For example, a truss jig intended primarily for residential construction may have a load rating of 3,000 lbs, while a commercial truss jig may require a load rating of 5,000 lbs. Heavier load ratings may

necessarily require correspondingly stronger hoist connections and couplings so that the increased loads can be tolerated.

The roof truss jig described herein is of substantial utility to a residential production builder, for example, who may be responsible for constructing 2-5 homes a day. Such a builder could typically supply a roof truss jig of the invention to a framer and crane operator, so that they could frame the roof of a first home. Upon completion of the first roof, the framer and crane operator would be able to proceed to a second worksite in order to frame a second roof, and so on.

Although the present invention has been shown and described with reference to the foregoing operational principles and preferred embodiments, it will be apparent to those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention. The present invention is intended to embrace all such alternatives, modifications and variances that fall within the scope of the appended claims.

CLAIMS

1. A roof framing jig, comprising:

a jig frame;

a hoist connection, adapted for suspending the jig frame; and

a plurality of truss supports secured to the jig frame, each truss support adapted to suspend an individual roof truss;

wherein the jig is configured to suspend a plurality of individual roof trusses in a predetermined spacing and orientation.

2. The jig of claim 1, wherein the jig frame comprises at least a pair of beams.

3. The jig of claim 2, wherein each truss support is disposed on a beam.

4. The jig of claim 3, wherein each truss support comprises a bracket connected to the beam, and a coupling that depends from the bracket.

5. The jig of claim 4, wherein the coupling is a flexible coupling, the bracket includes a pin, and the flexible coupling depends from the pin.

6. The jig of claim 1, wherein the jig is configured so that each individual roof truss is suspended from at least two truss supports.

7. The jig of claim 1, wherein the hoist connection comprises a plurality of attachments to the jig frame.

8. The jig of claim 1, wherein the hoist connection comprises four attachments to the jig frame defining the corners of a rectangle.

9. The jig of claim 1, wherein the jig is configured to suspend at least two roof trusses.

10. The jig of claim 1, wherein the jig is configured to suspend at least five roof trusses.

11. A method of assembling a roof truss assembly, comprising the steps of:

positioning a roof framing jig, wherein the jig includes a jig frame, a hoist connection adapted for suspending the jig frame, and a plurality of truss supports secured to the jig frame, each truss support adapted to suspend an individual roof truss;

suspending at least two individual roof trusses from at least two truss supports, wherein the jig is configured such that the individual roof trusses are suspended in a predetermined spacing and orientation; and

bracing the roof trusses to form a truss assembly.

12. The method of claim 11, further comprising installing at least some roof sheathing on the truss assembly.

13. The method of claim 12, further comprising removing the truss assembly from the jig, installing additional roof sheathing on the truss assembly, and resuspending the sheathed truss assembly from the jig.

14. The method of claim 11, further comprising hoisting the truss assembly into position on top of a building frame.

15. The method of claim 14, wherein the truss assembly is hoisted into position using the jig.

16. The method of claim 11, wherein the step of bracing the roof trusses includes installing at least lateral bracing.

17. The method of claim 11, wherein the step of bracing the roof trusses includes installing alignment bracing.

18. The method of claim 11, wherein the truss assembly is a flat roof truss assembly or a pitched roof truss assembly.

19. A method of assembling a roof truss assembly, comprising the steps of:

providing a roof framing jig, wherein the jig includes a jig frame, a hoist connection adapted for suspending the jig frame, and a plurality of truss supports secured to the jig frame, each truss support adapted to suspend an individual roof truss;

suspending an individual roof truss from each truss support;

positioning the roof framing jig so that the individual roof trusses are suspended in a predetermined spacing and orientation that is accessible from ground level;

bracing the roof trusses to form a truss assembly.

20. The method of claim 19, further comprising installing at least some roof sheathing on the truss assembly.

21. The method of claim 19, further comprising hoisting the truss assembly into position on top of a building frame.

22. The method of claim 21, wherein the truss assembly is hoisted into position using the jig.

DATED: 18 FEBRUARY 2003
PHILLIPS ORMONDE & FITZPATRICK
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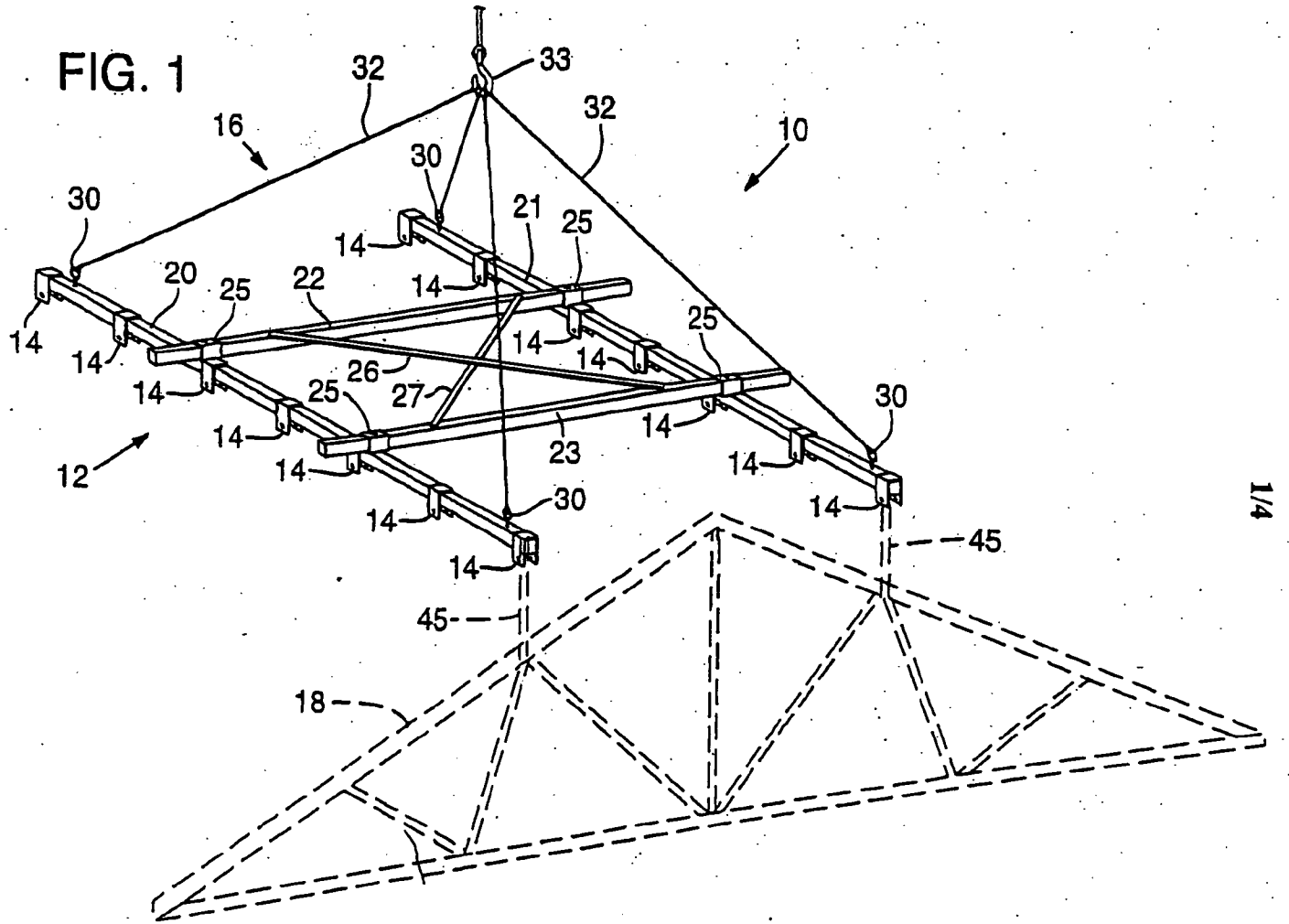
David B Fitzpatrick

FIG. 1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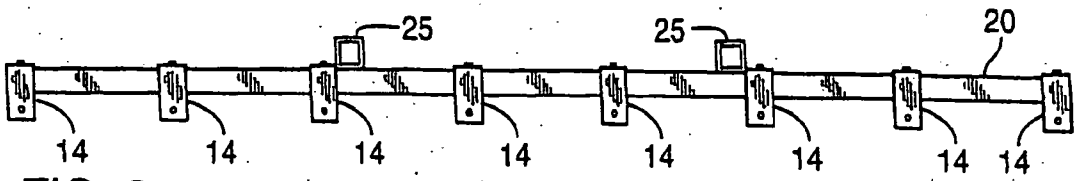
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FIG. 2

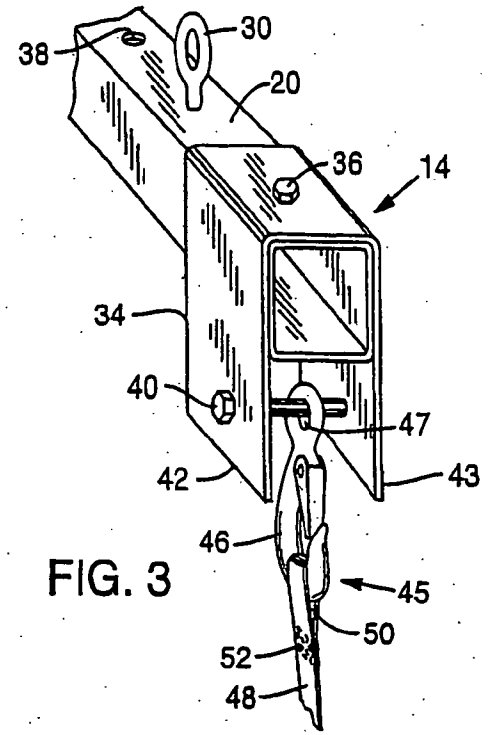
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FIG. 3

FIG. 4

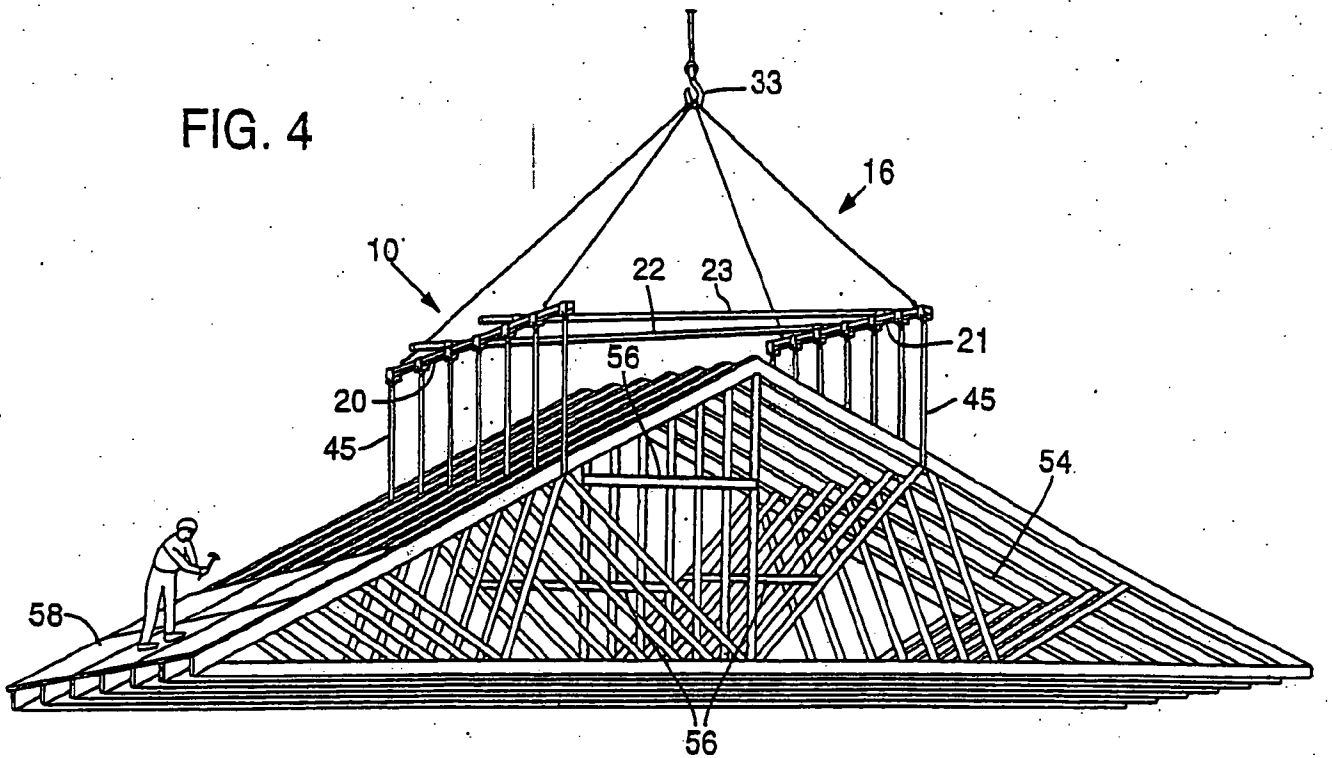
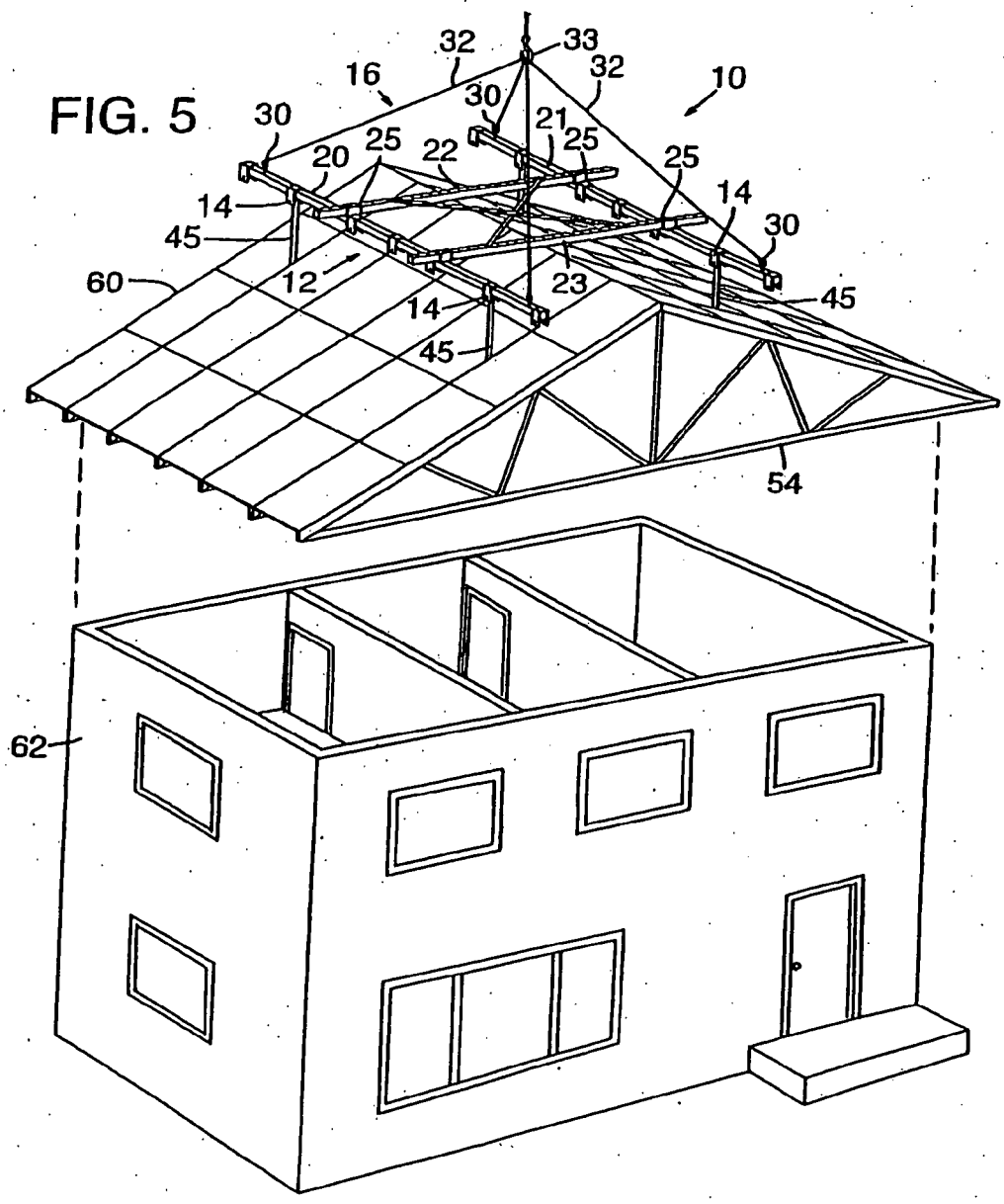


FIG. 5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