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NASA CASE NO. MFS-28545-1
PRINT FIG. #1

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APPARATUS FOR JOINING TRUSSES

TECHNICAL ABSTRACT

This invention relates to joint for holding a pair of trusses together in axial alignment.

The joint includes a pair of cylindrical locking elements 16 and 17 secured to the ends of the trusses 11 and 12, the locking elements each having a plurality of lands 21 and grooves 22 which lie in parallel planes when the trusses are in axial alignment. A pair of clamps 25 and 26 positioned on opposite sides of the trusses are provided with a plurality of lands 30 and grooves 31 which mesh with the lands and grooves on the locking elements, with means being provided for urging the clamps toward each other to bring the trusses into axial alignment and hold them in that position.

Inventors: Jeffrey Finckenor
Employer: NASA/MSFC
Date Filed: March 25, 1991
Serial Number: 674,636

APPARATUS FOR JOINING TRUSSES

ORIGIN OF THE INVENTION

The invention described herein was made by an employee of the United States Government and may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to structure for joining trusses.

2. Prior Art

Various devices for connecting or joining trusses and other similar structures are known. In some cases, one end of one of the trusses fits inside an end of the other truss and the trusses are held together by a pin which extends through transverse holes in the trusses. Another method for joining trusses in an axial position is to secure flanges to the ends of the trusses and simply bolt the flanges together. U. S. Patent 4,763,459 discloses structure for connecting trusses to form the baseline of a space station. In this structure a complex collet mechanism on the truss locks to a node point fitting.

Some of these types of truss joints are too unwieldy or difficult to use in assembling a baseline for a space station.

In others difficulty is encountered in aligning the trusses sufficiently to operate the connecting mechanism. Others have more parts than can be conveniently handled in space.

SUMMARY OF THE INVENTION

Apparatus for joining a pair of trusses in axial alignment wherein a pair of cylindrical locking elements are secured to the ends of the trusses, the locking elements each having a plurality of lands and grooves which lie in parallel planes when the trusses are in axial alignment. A pair of semi-cylindrical clamping members positioned on opposite sides of the locking elements are brought together by a bolt and nut to axially align and hold the elements, the clamping members having on the interior surfaces thereof a plurality of lands and grooves with the lands being shaped to mesh with the grooves in the locking elements. Preferably, the nut is a zip nut.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a an enlarged perspective view showing the structure of the joint of this invention, with one of the elements being rotated approximately 90 degrees from an aligned position to better show the configuration of the element.

Figure 2 is a cross sectional view of the unassembled joint of this invention showing the lands and groves in the clamping members which mesh with the lands and grooves in the locking elements to hold the trusses in axial alignment.

Figure 3 is a cross sectional view taken on line 3-3 of Figure 2 showing the joint in its assembled configuration.

DETAILED DESCRIPTION OF THE INVENTION

Referring now in detail to the drawings, there is shown a pair of trusses 11 and 12 which are to be joined by a joint 13 which will withstand both tensile and compressive forces and which will hold the trusses in precise axial alignment. If the joint is to be used in constructing a three dimensional network, nodes may be used to connect trusses. In this case, several trusses may be connected to a single node to extend from the node in various directions.

The joint 13 is made up of a pair of locking elements 16 and 17 secured to the trusses in positions coaxial to the trusses. The locking elements 16 and 17 may be secured to the trusses in various manners. For example, the locking element 17 is secured to a cylindrical member 18 which is provided with threads 20, with the threaded end of the member 18 being screwed into the end of the truss 12. In the drawing the locking element 16 is shown welded to the end of the truss 11.

It should be understood that the locking elements 16 and 17 are secured to whatever two parts that are to be held together and it is not necessary that the two parts be trusses. If a three dimensional structure, such as a baseline for a space station, is to be constructed several of the elements 16

or 17 may be secured to a hub to form a spider-like node to which trusses may be attached to extend in various directions.

Each of the locking elements is provided with a plurality of alternating lands 21 and grooves 22 which lie on planes perpendicular to the axis of the locking element. The lands 21 are trapezoidal in cross section and have a spacing such that the grooves 22 which are formed by the lands 21 have trapezoidal cross sections which are congruent to the cross sections of the lands 21.

A pair of semi-cylindrical, tubular clamps 25 and 26 positioned on opposite sides of the axially aligned locking elements are provided on the inner surfaces thereof with a plurality of alternating lands 30 and grooves 31. The lands 30 and grooves 31 on the clamps 25 and 26 are congruent to the lands 21 and grooves 22 on the locking elements 16 and 17 and are positioned so that when the clamps 25 and 26 are positioned on opposite sides of the locking elements, the lands on the clamps 25 and 26 enter the grooves 22 in the locking elements and the lands 21 on the locking elements 16 and 17 enter the grooves 31 in the clamps 25 and 26. When the clamps 25 and 26 are tightly pulled together, the sloping walls on the sides of the lands 21 and 30 will force the locking elements into a very precise alignment.

The clamp 25 is provided with a central aperture 35 through which a bolt 36 extends. A nut 37 on the bolt 36

serves to loosely retain the bolt in the aperture 35, the nut 37 not being tightened on the bolt 36.

The clamp 26 is provided with a web 40 aligned with the aperture in the clamp 25 and having therein an opening 41 in which is positioned a second nut 43 for receiving the bolt 36. The bolt 36 and the second nut 43 cooperate to pull the two halves of the joint together. It can readily be seen that, when the clamps 25 and 26 are pulled together the trusses will be axially joined by a joint which is capable of withstanding high tensile and compressive forces.

Preferably, the second nut 43 is a "zip" nut. A zip nut is a nut through which the bolt can be pushed in one direction, with the final tightening being done with a wrench. Such a nut is shown in U.S. Patent 4,378,187 to Robert L. Fullerton. The major advantage of a zip nut is that it is much easier to use than a conventional nut and requires much less time to tighten.

While it is not necessary, it is preferred that the clamp 25 be attached to the member 18 and the clamp 26 be attached to the truss 11. This can be done by tack welding. When this is done, there are fewer parts to be handled, so that assembly is simplified.

In operation, the assembler brings the ends of the trusses into close proximity and threads the bolt 36 into the nut 43. He then tightens the nut to pull the clamps 25 and 26

together. This aligns the trusses 11 and 12 and holds them together. If a zip nut is used, the assembler pushes the bolt 36 through the zip nut until it is snug and then finishes tightening the nut by using a wrench.

It can readily be seen that members other than trusses can be joined by the joint of this invention. Each of the locking elements 16 and 17 would be secured to the pair of members to be joined and the members would be positioned to axially align the locking elements. The clamps 25 and 26 are then positioned on opposite sides of the locking elements and secured together to lock the members together.

ABSTRACT OF THE DISCLOSURE

A joint for holding a pair of trusses in axial alignment wherein a pair of cylindrical locking elements are secured to the ends of the trusses, the locking elements each having a plurality of lands and grooves which lie in parallel planes when the trusses are in axial alignment. A pair of clamps positioned on opposite sides of the trusses are provided with a plurality of lands and grooves which mesh with the lands and grooves on the locking elements, with means being provided for urging the clamps toward each other to bring the trusses into axial alignment and hold them in that position.

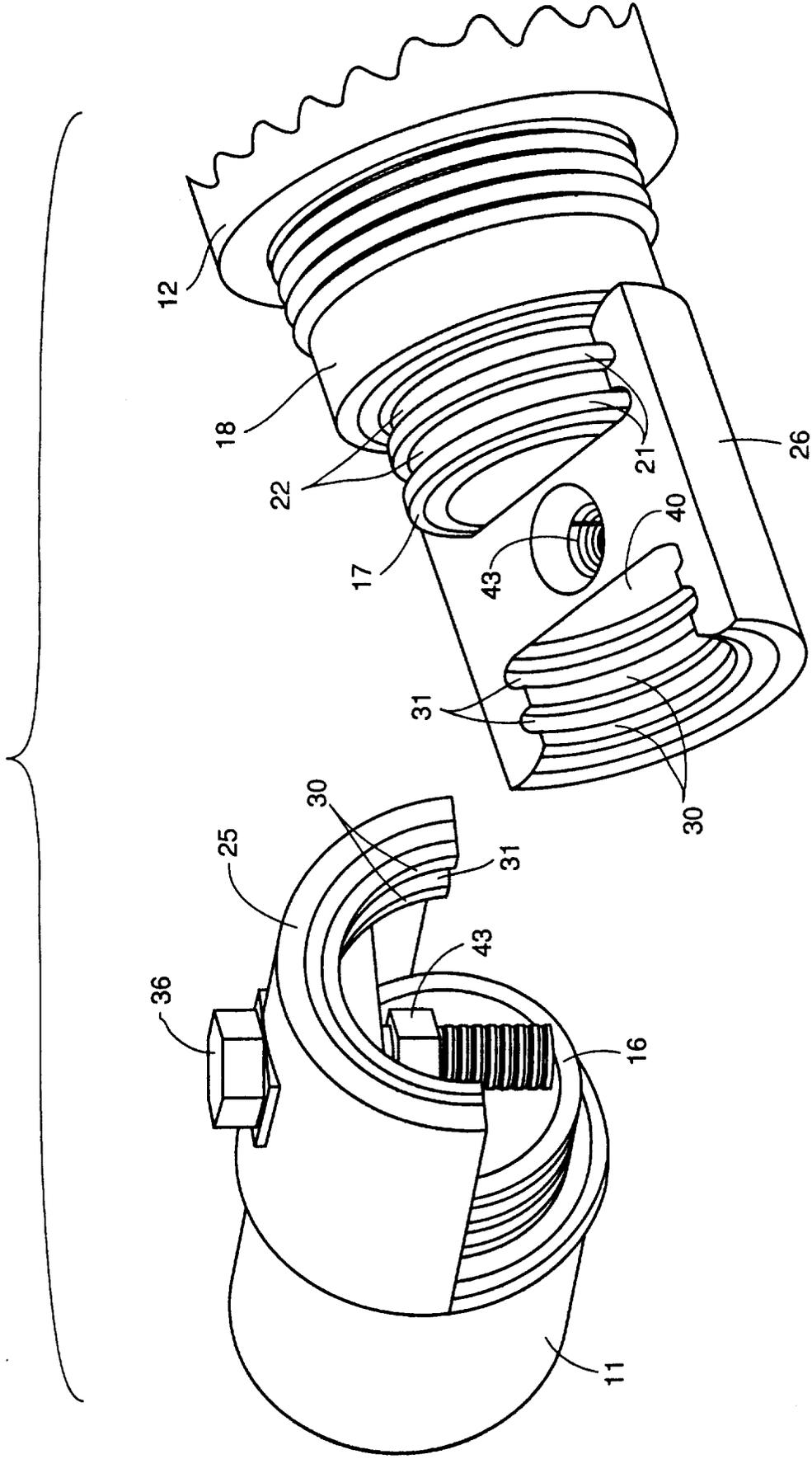


Figure 1

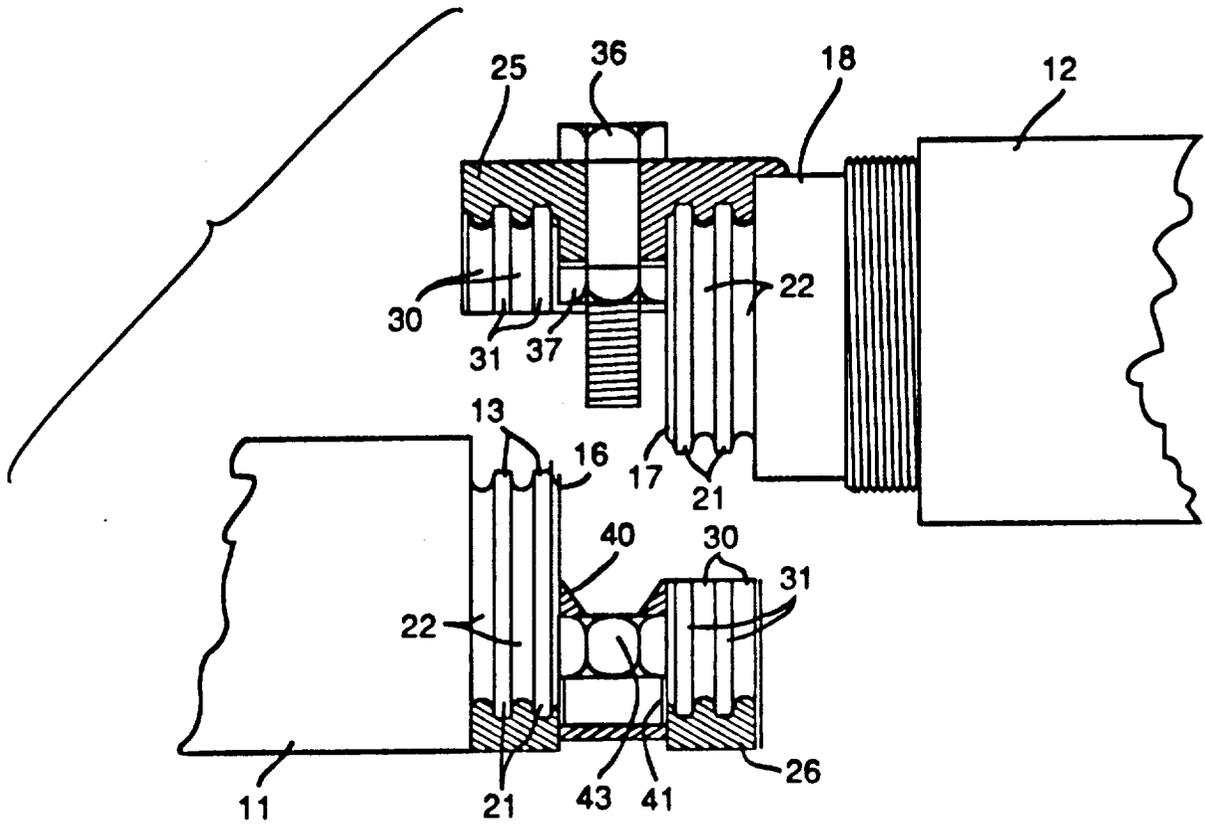


Figure 2

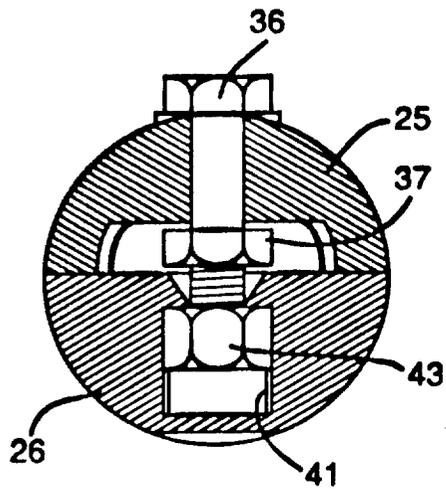


Figure 3