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TITLE

COLLAPSIBLE BOX TRUSS

FIELD OF THE INVENTION

The present invention relates to a collapsible box truss particularly, although not exclusively, envisaged for use in the erection of temporary trusses such as for carrying sound and light equipment for stage and theatre and the like.

More particularly the present invention relates to a collapsible box truss which has two truss webs located on, or parallel to, an X-Y axis and which fold out, to an expanded position, and collapse, to a storage position, on those axes, whilst being lockable on a Z axis, orthogonal to both the X and Y axes so as to support a load.

BACKGROUND OF THE INVENTION

In the art of transportable trusses for use in carrying sound and light equipment it is known to use rigid prefabricated box trusses and fix the box trusses together at the desired location. A disadvantage of such box trusses is that they require a relatively large amount of space for their transport and storage.

I have developed a box truss which can be collapsed for storage and transportation and expanded on site. One of the challenges in developing the box truss was in making it rigid when in the expanded position. I achieved this by using pivot members with a relatively long axis of pivot and located in the same plane as cross-members which join the two sides of the truss together.

SUMMARY OF THE INVENTION

Therefore it is an object of the present invention to provide a collapsible box truss which occupies a relatively small space when collapsed for storage or transportation.

In accordance with one aspect of the present invention there is provided a collapsible box truss comprising:

two elongate truss webs disposed substantially parallel to each other;

a plurality of cross-members disposed between the two truss webs;

a pivot member pivotably attaching each end of each of the cross-members to the truss webs so that the truss webs can be

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pivoted with respect to the cross-members between a collapsed position, wherein the truss webs are located proximate each other in side by side relation, and an expanded position, wherein the truss webs are located at a distance from each other, each pivot member having an elongate axis about which the truss web pivots so that the collapsible box truss is substantially rigid when in the expanded position; and,

locking means to lock the truss webs in the expanded position.

Typically, the pivot axis of each of the pivot members is greater than about 10% of the height of each of the truss webs.

Typically, flooring members are located between the side members to assist in walking along the truss when in the expanded position.

Typically, the flooring members can pivot with respect to the truss webs so that the flooring members need not be removed when the truss webs are moved to the collapsed position.

Alternatively, the flooring members could be removable from the truss webs to facilitate moving of the truss webs to the collapsed position.

BRIEF DESCRIPTION OF THE DRAWINGS

An exemplary embodiment of the present invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of a collapsible box truss in accordance with the present invention, with its truss webs shown in an expanded position;

Figure 2 is an end view of the collapsible box truss of Figure 1 with its flooring members removed for clarity;

Figure 2A is an end view to an enlarged scale of a pivot member of the collapsible box truss of Figure 2;

Figure 3 is a plan view of the collapsible box truss of Figure 2;

Figure 4 is an end view of the collapsible box truss of Figure 1 shown with its truss webs in a collapsed position;

Figure 5 is a plan view of the collapsible box truss of Figure 1;

Figure 6 is a cross-sectional end view of the collapsible box truss of Figure 1 showing the attachment of the flooring

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members; and,

Figure 7 is cross-sectional end view of the collapsible box truss of Figure 6 showing the flooring members in a stored position.

5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

In Figure 1 there is shown a collapsible box truss 10 comprising two elongate truss webs 12, a plurality a cross-members 14 and a plurality of flooring members 16.

The elongate truss webs 12 each comprise a bottom side beam 20, a top side beam 22, a plurality of vertical supports 24 and a plurality of side braces 26. The vertical supports 24 are connected substantially at 90° between the bottom side beam 20 and the top side beam 22. Whilst the side braces 26 are connected at an acute angle between the bottom side beam 15 20 and the top side beam 22 and/or the vertical supports 24 so as to make each truss web 12 more rigid.

Particularly as shown in Figures 2 and 2A, the cross-members 14 are pivotably connected between the two truss webs 12 by pivot members 30. The pivotable connection allows for 20 the two truss webs 12 to be pivoted between an expanded position, as shown in Figure 2, and a collapsed position, as shown in Figure 4. In the exemplary embodiment each pivot member 30 comprises a bracket 32 fixed to one of the vertical supports 24, a brace 34 fixed to one of the cross-members 14 25 and a pivot pin 36 pivotably attaching the brace 34 to the bracket 32. Each of the pivot members 30 also comprises a C-flange 37 fixed to the bottom side beam 20 and a pin 38 pivotably attaching one the end of one of the cross-members 14 to the bottom side beam 20. The two pins 36 and 38 are centred 30 on the same axis, which axis is parallel to the vertical support 24 so that the cross-member 14 pivots at 90° to the truss web 12.

It is important that the pivot axis of the pivot members 30 be greater than about 10% of the height of the truss webs 35 12 (ie the length of the vertical supports 24). This has the effect of giving the collapsible box truss 10 significantly more rigidity in the expanded position than would otherwise be the case. Ideally the pivot members 30 are also in the same plane as the cross-members 14 to add to this rigidity.

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It is important that the axes of pivot of the pivot members 30 are outside of the perimeter of the vertical supports 24. This has the effect that the truss webs 12 can be folded flat against each other with the cross-members 14 located between the two truss webs 12 and mutually parallel to them (in the collapsed position). In the event that the axes of pivot of the pivot members 30 are inside the perimeter of the vertical supports 24 the cross-members 14 end up at an angle to the two truss webs 12 and hence the truss 10 is not as compact in its collapsed position.

Two of the pivot members 30 are used to connect each cross-member 14 between the two truss webs 12. In the exemplary embodiment there are two cross-members 14 used to connect the two truss webs 12 together at each of the vertical supports 24, one being located between the bottom side beams 20 and the other being located between the top side beams 22.

Particularly as shown in Figure 5 the flooring members 16 are disposed between the two truss webs 12. Typically, there is one flooring member 16 situated between each adjacent pair of cross-members 14. Each flooring member 16 comprises a plurality of floor braces 40 (such as two floor braces 40), two U-shaped brackets 42 and 44 for each floor brace 40, and a grid 46. The grid 46 is disposed between the adjacent pair of cross-members 14 and is fixed upon the floor braces 40.

One end of each of the floor braces 40 is typically pivotably attached by a pivot pin 48 inserted into the U-shaped bracket 42 at one of the bottom side beams 20. The other end of each floor brace 40 is typically secured to the other U-shaped brackets 44 located on the other bottom side beam 20 by a locking pin 50. Hence, the flooring members 16 can be pivoted between an in use position (see Figures 1, 2 and 5), wherein the grid 46 is oriented between the two bottom side beams 20 and between an adjacent pair of the cross-members 14, and a storage position (see Figures 4 and 7), wherein the grid 46 is oriented substantially in a plane between one of the bottom side beams 20 and its corresponding top side beam 22. The movement of the flooring member 16 between the in use position and the storage position is indicated by arrow 52 in Figure 6. Typically, the ends of the floor braces 40 each have

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flanges 54 projecting upwardly and outwardly to engage with the U-shaped brackets 42 and 44. This allows the main axis of the floor brace 40 to lie in a plane between the two bottom side beams 20.

5 In an alternative arrangement the floor braces 40 can be attached to the cross-members 14 and can be pivoted to a storage position wherein the floor braces 40 are located between the vertical supports 24 and their corresponding cross-members 14.

10 In a further arrangement the floor braces 40 are not attached to either the bottom side beams 20 or the cross-members 14 but are rather removable and when in situ sit in the U-shaped brackets 42 and 44 and are locked in place by the locking pins 50.

15 The collapsible box truss 10 may also include a locking member (not shown). The locking member is used to lock the collapsible box truss 10 into the expanded position. This is of particular importance in the event that the flooring members 16 are removable. In one form the locking member could be a
20 telescopic arm disposed between the bottom side beams 20 of the two truss webs 12 proximate adjacent cross-members 14. The telescopic arm is locked in length once the collapsible box truss 10 is in the expanded position. To collapse the truss 10 the telescopic arm is first unlocked so as to allow the two
25 truss webs 12 to be pivoted with respect to each other.

Looked at in more general terms the locking of the collapsible box truss 10 in the expanded position can be achieved by using linear lock, such as a bar (whether telescopable or not) or a planar lock such as a flooring member
30 16.

In use, the collapsible box truss 10 is stored and can be readily transported when in the collapsed position with the two truss webs 12 pivoted against each other.

Once the collapsible box truss 10 is at a location where
35 it is required to be used the truss webs 12 are pivoted with respect to each other about the pivot members 30 which connect the cross-members 14 to the vertical supports 24. This causes the truss webs 12 to move from the collapsed position shown in Figure 4 to the expanded position shown in Figure 2.

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The flooring members 16 are then pivoted from their storage position, shown in Figure 7, to their in use position, shown in Figure 6, about the pivot pins 48. Once the flooring members 16 engage with the U-shaped brackets 44 the locking pins 50 are set in place to lock the flooring members 16 in to position. This has the added effect of locking the two truss webs 12 in the expanded position.

Sound and lighting equipment or the like can then be rigged from the collapsible box truss 10 such as for use in stage and theatre performances.

Depending upon the size of the collapsible box truss 10 the grid 46 can be walked on like a foot path (suspended in the air) with the walker stepping over the cross-members 14 connected between the vertical supports 24 proximate the top side beams 22; or, where the truss 10 is larger, the walker can crawl along the grid 46 through the area defined by the vertical supports 24, the grid 46 and the upper-most cross-members 14; or, where the truss 10 is larger still the walker can walk through the area defined by the vertical supports 24, the grid 46 and the upper-most cross-members 14. That is the truss 10 defines a "crawl space" for movement along it. It is important that there be little or no intrusion into the crawl space. Otherwise it becomes difficult or even impracticable to move along the truss 10 through the space defined between the truss webs 12 and the flooring members 16.

A plurality of the collapsible box trusses 10 can be connected together using a turnbuckle spigot assembly as described in my co-pending patent application entitled Turnbuckle Spigot Assembly, which is considered to be brought into this specification by reference. The turnbuckle spigot assemblies can also be used to connect the collapsible box trusses 10 to a wall or mounting box or the like.

Modifications and variations such as would be apparent to a skill addressee are considered within the scope of the present invention. For example, the elements of the truss 10 could be made from metal materials or plastics materials or the like. Also, the truss 10 could be arranged on its end to form a tower. In this case the flooring members 16 could be in the form a zig-zag braces between the two truss webs 12. Further,

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the locking members could be in the form of triangular members pivoted at their base on one of the side beams 20 or 22 and having their apices releasibly locked to the other side beam 20 or 22. That is, the said triangular locking members could
5 lock between the side beams 20 and further ones of the locking members could lock between the side beams 22. The triangular locking members could then pivot, one up and the other down, to inside each of the truss webs 12 in the collapsed position. Still further, a pin lock or a three dimensional lock could be
10 used to lock the collapsible box truss 10 into the expanded position.

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CLAIMS

1. A collapsible box truss comprising:

two elongate truss webs disposed substantially parallel to each other;

5 a plurality of cross-members disposed between the two truss webs;

a pivot member pivotably attaching each end of each of the cross-members to the truss webs so that the truss webs can be pivoted with respect to the cross-members between a collapsed position, wherein the truss webs are located proximate each other in side by side relation, and an expanded position, wherein the truss webs are located at a distance from each other, each pivot member having an elongate axis about which the truss web pivots so that the collapsible box truss is substantially rigid when in the expanded position; and,

locking means to lock the truss webs in the expanded position.

2. A collapsible box truss according to Claim 1, also having flooring members located between the cross-members, the flooring members being pivotably attached to one of the truss webs so that the flooring members can be pivoted between an in use position, wherein the flooring members are disposed between the two truss webs and substantially perpendicular to each of the truss webs, and a storage position, wherein the flooring members are disposed substantially in the plane of one of the truss webs so that the truss can be moved to the collapsed position, and hence the flooring members need not be removed when the truss webs are moved to the collapsed position.

3. A collapsible box truss according to Claim 2, in which the cross-members are provided with pivot members having an elongate axis of pivot for providing rigidity to the collapsible box truss when in the expanded position.

4. A collapsible box truss according to Claim 3, in which the axis of pivot has a length of greater than 10% of the height of the truss web.



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5. A collapsible box truss according to Claim 3, in which the pivot members each have a brace fixed at one end to a respective one of the cross-members and pivotably attached to an upright support of a respective one of the truss webs.

5 6. A collapsible box truss according to Claim 2, in which the cross-members are provided with pivot members for allowing pivoting of the two truss webs between the collapsed position and the expanded position, the pivot members each having an axis of pivot which is outside of the plane of the truss webs
10 so that the truss webs can be disposed substantially adjacent each other in the collapsed position.

7. A collapsible box truss according to Claim 1, in which flooring members are pivotably attached to respective ones of the cross-members and pivotable between an in use position,
15 wherein the flooring members are disposed between the two truss webs and substantially perpendicular to each of the truss webs, and a storage position, wherein the flooring members are disposed substantially in the plane of respective ones of the cross-members so that the truss can be moved to the collapsed
20 position, and hence the flooring members need not be removed when the truss webs are moved to the collapsed position.

8. A collapsible box truss according to Claim 1, in which the locking means is an elongate member which can be locked in position when the truss webs are in the expanded position for
25 inhibiting movement of the truss webs to the collapsed position.

9. A collapsible box truss according to Claim 5, in which the elongate member is a telescopable rod.

10. A collapsible box truss according to Claim 1, in which the
30 locking means is a planar member pivotable on one of the truss webs and attachable to the other truss webs for inhibiting movement of the truss webs to the collapsed position.

11. A collapsible box truss according to Claim 10, in which

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the planar member is chosen from a set including a triangular member and a rectangular member.

12. A collapsible box truss according to Claim 1, in which the truss webs are disposed vertically to form a tower.

