

P9560GB-ALM/LH/ar

"A composite platform"

THIS INVENTION relates to a composite platform.

In conventional scaffolding structures it is common practice to use wooden or metal planks to construct walkways, staging structures and platforms. It is very labour intensive to set up staging structures or the like inside marine vessels such as oil tankers for conducting maintenance and repairs. A wooden plank normally weighs approximately 25 kilograms which is too heavy for workers to erect a staging structure efficiently. Moreover, the only access to the tanks of, for example, an oil tanker is through a 50cm diameter hole. The heavy wooden planks are unwieldy and difficult to pass through the small tank hole to set up the staging structure inside the tank.

Hollow metal planks have been used to construct staging or scaffolding structures. However, comparatively minor bending or deformation of a metal plank severely reduces the mechanical strength thereof. In particular, metal planks have been manufactured from extruded aluminium sections which, although light, are of low mechanical strength. Aluminium is generally more easily bent and distorted than steel and would, therefore, suffer more damage in general use and from mishandling. Metal planks are also easily corroded by sea water and the cleaning chemicals used in a shipyard environment.

Normally, it takes sixty to eighty workers between one and two weeks to erect a staging structure for two tanks of an oil tanker, where access into the respective tanks is through a hole which is 50cm in diameter. Typically, thirty lorries are needed to transport 8,000

wooden planks and 10,000 metal tubes for the erection of a staging structure for a tank.

To ameliorate the above mentioned problems, the present invention provides a composite platform comprising: a plurality of first substantially parallel, spaced apart elongate elements each formed with a plurality of apertures therethrough; a plurality of elongate second elements extending substantially normal to the first elements through aligned apertures of the first elements; and a plurality of spacer elements engaged with the second elements between the first elements to maintain the first elements in spaced apart relationship.

In order that the present invention may be more readily understood, an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an assembled composite platform embodying the present invention;

Figure 2 is a plan view of the composite platform of Figure 1, cross-members thereof being shown in phantom;

Figure 3 is a perspective view of a length of tube which forms part of the composite platform of Figure 1;

Figure 4 is a perspective view of a cross-member, a plurality of spacer clips and two end caps which form part of the composite platform of Figure 1; and

Figure 5 is a perspective view of one of the spacer clips of Figure 4.

Referring to Figures 1 and 2, a composite platform 1 embodying the present invention comprises a plurality of tubes 2 arranged, in parallel, side by side and linked together by a plurality of cross-members 3.

Turning to Figure 3, each tube 2 is elongate, hollow and of rectangular cross-section. Preferably each tube 2 is manufactured using pultrusion techniques from fibre reinforced plastics and, more particularly, fibreglass, carbonfibre and/or aramid. The plastics material is preferably a thermoset resin such as polyester, vinylester or epoxy resin. One side 4 of the tube 2 is formed with a series of equally spaced holes 5 which are aligned with a corresponding series of equally spaced holes 5' formed on the opposite side 4' of the tube 2. Opposite pairs of holes 5, 5' are preferably formed in a single drilling action to ensure alignment. The other sides 6, 6' of the tube 2 are flat and plain. One or both of these sides 6, 6' may be provided with a non-slip surface 7.

As shown in Figure 4, each cross-member 3 comprises a solid elongate rod. The cross-members 3 are made using pultrusion techniques from fibre reinforced plastics. In particular, the use of carbonfibre and/or aramid is preferred. The plastics material is preferably a thermoset resin such as polyester, vinylester or epoxy resin. Both ends of the cross-member 3 are formed with respective threaded portions. The diameter of the cross-members 3 is sized to be a sliding fit within the holes 5, 5' of the tubes 2.

Referring back to Figures 1 and 2, a plurality of tubes 2 are aligned such that the respective sides 4, 4' of adjacent tubes 2 formed with the holes 5, 5' are side by side but spaced apart from one another and the holes 5, 5'

are aligned with another and receive a plurality of cross-members 3. The cross-members 3 pass through the holes 5, 5' in the tubes 2 to form a lattice structure. Since the tubes 2 are spaced apart from one another, a portion 8 of each cross-member 3 is exposed between neighbouring tubes 2. A spacer clip 9 comprising a cylindrical circlip is forced over and around each exposed portion 8 of the cross-members 3 to maintain the tubes 2 in spaced apart relationship. A threaded end cap 10 is threaded onto each threaded end portion of each of the cross-members 3 to lock the cross-members 3 into the lattice structure with the tubes 2. This arrangement is most clearly seen in Figure 2.

The spacer clips 9 and the end caps 10 are formed from pultruded glassfibre reinforced plastics (GRP) tubing. A V-shaped cut is made in the cylindrical wall along the longitudinal axis of the tubing to form a spacer clip 9 and the inner surface of such a GRP tube is threaded to form an end cap 10. The spacer clip 9 may also be formed from short fibre reinforced plastics by injection moulding.

The cross-members 3 are coated in adhesive prior to insertion into the holes 5, 5' in the tubes 2 and the inner surface of each of the spacer clips 9 is coated with adhesive before being pushed onto the cross-members 3. The end caps 10 are bound on the threaded ends of the cross-members 3 by a suitable adhesive. This bonds the entire lattice structure together.

One or both of the top and bottom surfaces (comprising the sides 6, 6' of the tubes 2) of the composite platform 1 is provided with the non-slip surface 7. Preferably, the coating of anti-slip paint is provided on the sides 6, 6' of the tubes 2 before the lattice

structure is formed. The anti-slip paint is either sprayed or brushed on the respective side 6, 6' of the tube 2. The anti-slip paint is preferably made by mixing 40% sand with 60% epoxy resin by volume. The thickness of the non-slip surface 7 is between 1 and 2mm.

The above described lattice structure forms the composite platform 1 embodying the present invention. The composite platform 1 defines: a top and bottom surface formed by the exposed flat sides 6, 6' of the rectangular tubes 2, two longitudinal edges formed jointly by the sides 4, 4' of the tubes 2 and the ends of the cross-members 3; and two lateral edges formed by the ends of the tubes 2.

As previously described, the cross-section of the tubes 2 is preferably rectangular to provide good shear and twist load resistant properties. It is, however, envisaged that T-shaped and I-shaped cross-sections may be used

As shown in Figures 1 and 2, the gap between adjacent tubes 2 as defined by the spacer clips 9 is the same as the thickness of the tubes. Thus, the ends of two similar composite platforms may be interleaved with one another to create a smooth and flat work surface without discontinuities.

The above described composite platform is extremely well suited for use in constructing scaffolding structures inside oil tankers or the like. The platform is extremely light and its weight to strength ratio is better than typical wooden or metal planking.

A tube 2 has a length of, for example, 2.5 metres and is formed with holes 5, 5' having a diameter of approximately 8mm. The spacing between holes 5, 5' is

preferably greater than 200mm and less than 300mm. The thickness of the wall of the rectangular tube 2 is greater than 2mm and preferably greater than 3mm. The height of the tube - i.e. the distance between the sides 6, 6' is greater than 32mm. A typical composite platform may comprise six tubes 2 as shown in Figures 1 and 2 - which are assembled to form a platform having a width of approximately 250mm. Such a platform, having a span in the region of 2.5 metres, can withstand a 300kgm load.

**CLAIMS:**

1. A composite platform comprising: a plurality of first substantially parallel, spaced apart elongate elements each formed with a plurality of apertures therethrough; a plurality of elongate second elements extending substantially normal to the first elements through aligned apertures of the first elements; and a plurality of spacer elements engaged with the second elements between the first elements to maintain the first elements in spaced apart relationship.
2. A composite platform according to Claim 1, wherein a respective spacer element is engaged with each part of a second element exposed between first elements.
3. A composite platform according to Claim 1 or 2, wherein the first elongate elements comprise hollow tubes of rectangular cross-section and the second elongate elements comprise solid rods.
4. A composite platform according to any preceding claim, wherein the first and second elements are formed using pultrusion techniques from fibre reinforced plastics.
5. A composite platform according to Claim 4, wherein the fibre or fibres used is/are fibreglass, carbonfibre and/or aramid.
6. A composite platform according to Claim 4 or 5, wherein the plastics material is a thermoset resin.
7. A composite platform according to Claim 6, wherein the thermoset resin is polyester, vinylester or epoxy resin.



8. A composite platform according to any preceding claim, wherein the ends of the second elements are provided with end caps to secure the first and second elements together.

9. A composite platform according to any preceding claim, wherein the apertures comprise a series of equally spaced apertures formed along the length of the first elements.

10. A composite platform according to any preceding claim, wherein the cross-section of the second elements corresponds to the cross-section of the apertures.

11. A composite platform according to any preceding claim, wherein the first elongate elements are spaced apart from one another by a distance equivalent to the width of the first elongate elements so that an end portion of a composite platform according to any preceding claim may be interleaved with an end portion of another composite platform according to any preceding claim.

12. A composite platform according to any preceding claim, wherein at least a portion of the first element is provided with a non-slip surface prior to assembly of the composite platform.

13. A composite platform substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

14. Any novel feature or combination of features disclosed herein.