

Method and assembly for transferring space modules

The present invention relates to a method according to the preamble of claim 1 for transferring prefabricated ship cabin modules and similar components in ships,
5 offshore structures and buildings erected on land.

The invention also concerns an assembly according to the preamble of claim 5.

10

Increasingly it is desired that structures of ships, offshore drilling platforms and similar constructions be first assembled into prefabricated components which are then mounted in place to the ship's base structure on-site at the shipyard. This approach offers an essential
15 time reduction in the erection schedule and cost cutting, because a major part of the structures can be prefabricated industrially on efficient manufacturing lines. Particularly cabin structures are typically prefabricated into fully furnished modules which are
20 transferred as complete modules into the ship. Then, the decoration and furnishing works of the cabin module can be completed in the indoor premises of assembly halls thus avoiding awkward detail furnishing in the ship itself. However, prefabricated cabin modules are
25 relatively large and their transfer requires different kinds of accessories to aid their final positioning. Such transfer operations are complicated by the fact that a semifinished ship does not necessarily have enough room
30 to permit the use of hoists, fork trucks and other transfer equipment.

US Pat. No. 3,363,597 discloses a method of assembling the ship's interior spaces from prefabricated space
35 modules. According to this method, the interior spaces are assembled from space modules equipped with support flanges, whereby such modules are designed to include

several space units in one module. The interior space modules are mounted in a matrix-like beam lattice in several tiers by inserting the modules in the openings of the lattice and then fixing the modules to each other.

5 The transfer of such modules is extremely clumsy as they are not compatible with any conventional transfer equipment.

10 Patent publication SE 377,681 discloses a container ship in which the container hold may be temporarily converted into a passenger space comprised of cabin and/or similar containerized modules. The containers are connected by temporary arrangements to the ship's HPAC and electrical systems. The assembly of the passenger cabin section
15 takes place using cabin, shower, stairway and bathroom modules with dimensions compatible with the ISO standard containers. Most of these units are adapted to have an accessway extending laterally through the unit. Units of the same tier are placed in rows so that the accessways
20 form corridor sections, which can be joined from the opposite sides of the same stairway module to provide an access between two superimposed tiers. According to the disclosed arrangement, identical modules in the superimposed tiers are suggested to be superimposed above
25 one another between two decks of the ship. Hatchways with covers are provided between the uppermost stairway module and the upper deck. Permanently installed HPAC and electrical supply systems are placed on the lowermost deck. The containerized modules are transferred by means
30 of conventional container handling equipment. Such a system is suited to special applications and temporary service only, and is not intended for use in conventional shipbuilding.

35 FI Pat. No. 62,984 describes a system which is based on the use of prefabricated, floorless cabin modules. Except for their lacking floor, such modules are ready-for-use

space modules which form a finished, easy-to-mount cabin requiring no major finishing and decoration after its installation in place. The transfer of the floorless cabin module to its installation site occurs by first mounting detachable wheels to the corners of the module and then pushing the module from the inside. In this manner the modules can be easily transferred even to tight places. The transfer elements which are temporarily connected to the cabin modules are economical in use, and, e.g., with respect to a permanent transport carriage, such temporary transfer equipment offer significant cost savings as the temporary transfer elements can be recovered for reuse. The wheels to be temporarily adapted or mounted to the corners of the cabin module should preferentially extend horizontally only marginally outside the cabin module. Each transport unit is provided with a detachable transfer element and a frame to which the cabin module is supported during the transfer operation. The transfer element, e.g., a wheel is supported to the frame of the transport unit at the underside of its bottom corners and edges.

By arranging the transport units basically to the inside of the cabin module, the module is easy to support laterally to the frame of the transport unit. Then, the transfer elements can be replaced from inside the cabin unit. A shortcoming of this transfer system is that lifting the cabin module onto the wheels still requires the use of a separate lift means, which complicates the handling of the cabin module. Wheels of the above-described type are suitable for the transfer of floorless cabin modules only, which curtails the applications of this arrangement. Moreover, the cabin module must be rather rigid, because its weight is imposed directly from above onto the fixing elements of the wheels which are attached to the lower edges of the walls and said fixing elements are relatively poorly suited to provide support

to the cabin module. Hence, the cabin module lower edge must be reinforced to make the module edge capable of taking the stresses at the fixing points of the transfer elements. The mounting of the space module is further
5 impeded and complicated by the fact that the space module must be opened and a mechanic has to enter the module in order to mount the transfer elements in place and to push the module. As it is difficult to guide the module in place by operating from its inside, several craftsmen are
10 required to handle the module.

Prior to their transfer and mounting in place, such modular cabins are outfitted with required furniture and other equipment. This arrangement avoids, e.g., the
15 moving of furniture through the narrow accessways of the ship. In fact, furniture and other equipment possess an inherent rigidity in themselves. This property is utilized by mounting the fixed furniture and other permanent appliances to the walls of the cabin module so
20 as to increase thereby the rigidity of cabin modules.

FI Pat. No. 62,984 further mentions that cabin modules can be moved and mounted in place supported by an air cushion. To form and maintain such an air cushion, the
25 cabin modules are provided at their open bottom with a tight, pouch-like apron unit suited for filling by air feed and having an exit opening. The pouch-like element which thus supports the cabin module is made from a plastic film, for instance. However, such a method is
30 rather expensive and the large fan required to keep the module floating causes severe noise abatement problems in the closed spaces of a ship.

It is an object of the present invention to provide a
35 method in which different kinds of space modules can be transferred in an easy and simple manner without the use of auxiliary lifting equipment.

The object of the invention is accomplished by providing the transferrable space module with at least three scaffold-stands with wheels, whereby said stands are attached at their distal ends with respect to the wheels to the outside of the module so that the distance between the attachment point and the lower edge of the module is smaller than the maximum length of the stand from the attachment point to the extreme lower point of the wheel, and then the module is elevated with the help of the stands to the transfer position.

More specifically, the method according to the invention is characterized by what is stated in the characterizing part of claim 1.

15

Furthermore, the assembly according to the invention is characterized by what is stated in the characterizing part of claim 5.

20 The invention offers significant benefits.

The most important advantage of the invention is that the assembly itself can function as the lifting means thus disposing with the need for any separate lifting equipment. The lifting operation is performed from outside the space module, whereby the module need not be opened for lifting. According to the most advantageous embodiment of the invention, the lifting members are attached to the upper edge of the module roof, whereby the module weight is distributed evenly between the roof structures and the module is prevented from swaying under stressed imposed by its own weight during the transfer operation. Hence, the present invention makes it possible to transfer even the most elastic modules, because the module is supported by the lifting members during its transfer. Another embodiment of the invention includes a lattice fixed above the module so as to further support the module. The

lifting and transfer of the module require no large high-power or special equipment. As the module is advantageously lifted at fixed lifting points attached to the module, the same lifting points may also be used for other transport operations of the module. The method according to the invention makes it possible to handle all kinds of space modules no matter if they have a floor or not. Typical objects to be handled are the cabin modules of ships and drilling platforms, room modules of hotels and floating hotels, various machinery spaces including spaces for lift machinery and similar equipment and other prefabricated spaces.

As the space modules are relatively light weighing typically approx. 2000 - 3000 kg, in a four-stand system the load imposed on each stand is accordingly rather low permitting a lightweight construction of the stand. Hence, a single mechanic can alone handle the stands and prepare the module for the transfer operation.

The invention is next examined in greater detail with reference to attached drawings, in which:

Figure 1 illustrates a space module with the transfer members according to the invention attached thereto;

Figure 2 illustrates a detail of the diagram of Fig. 1; and

Figure 3 illustrates an embodiment of the connection between the space module and the transfer members.

Now referring to the drawings, the transfer of a single space module requires four transfer members or stands 3. Each stand 3 comprises two telescoping tubular elements 11, 12, a stand length adjusting mechanism 9, a wheel mounted on a shaft 6 at the lower end of the stand and a

fixing stub 2 of hollow square section mounted to the upper end of the stand by means of a shaft 7 as well as an eyelet 5 for a tightening strap. Each upper corner of the space module 13 to be transferred is provided with a hollow square section 8 into which the fixing stub 2 is adapted to fit. In the embodiment illustrated in Fig. 1, the hollow square section 8 is extended over the entire length of the long sides of the space module 13, whereby the sections 8 provide additional support to the roof of the module 13. When prepared ready for the transfer setup, the module 13 is surrounded by a tightening strap 1 adapted to pass via the eyelets 5. The length adjustment of the stands is implemented in the exemplifying embodiment illustrated in the drawings so that the telescoping tubular elements 11 and 12 of the stand are provided with a series of drilled holes 14 into which a locking pin 15 can be inserted. Thus, the length of the stands is readily adjustable by moving the position of the locking pin 15 in the holes.

20

According to the invention, the space module 13 is transferred as follows. During its prefabrication stage, two sides of the module are provided with a hollow square section 8 extending over the entire length of the side. The open ends of these hollow sections 8 form the attachment points for the transfer stands 3. The connection of the stands 3 to the module takes place by inserting the square fixing stub 2 into the end of the square hollow section 8. The length of the stands is adjusted such that the length L of the stand from the shaft 7 of the fixing stub to the shaft of the wheel is at least as large as the distance H of the hollow square section 8 from the lower end of the module 13. With this height adjustment, the module is elevated by the radius of the wheels 4 of the stands 3 from the ground level. When required, the stand can be set for a larger length,

35

whereby more space remains between the bottom of the module and the transport route.

After the stands 3 are fixed to the upper corners of the module, the tightening strap 1 is passed about the module 13 via the eyelets 5. At this stage, the stands 3 are still inclined with respect to the walls of the modules 13 at an angle determined by their set length. When the tightening strap 1 is tightened with the help of a tightening device 10, the stands 3 are pivotally rotated about the shaft 7 and thus moved closer to the walls of the space module 13. Simultaneously, the module is elevated from the ground level, and as the module is elevated sufficiently high from the ground, it can be moved by pushing to the desired place. The stands can be left either in a slightly tilted position or tightened upright against the walls of the module as shown in Fig. 1. Obviously, the loading of the stands remains lower in the upright position.

20

Besides those elucidated in the foregoing, the invention may have alternative embodiments.

The length adjustment of the stands can be implemented in a plurality of different manners, for example, by jack screws. Stand constructions based on the upper pivotal joint and a simple, stepwise adjustable arrangement of stand length are essentially less complicated to implement and less costly to manufacture. In fact, the stand length adjustment is not absolutely necessary at all if the modules to be transferred have a standard height, or alternatively, if a selection of stands of different lengths are used. The connection between the space module and the stands may also be implemented in any desired manner. According to an interesting embodiment the module is grabbed by means of a lattice placed atop the roof of the module. The connection

35

between the lattice and the module may be, e.g., similar to that used to transfer cargo containers, whereby the module may be easily moved by means of container handling equipment. Obviously, the stands may be fixed permanently to the roof grabbing lattice, while a detachable connection is preferred due to the easier handling and transport of the separate members detached from each other. The roof grabbing lattice is advantageously made adjustable by its size. All connections can be assured by locking pins, for instance.

When desired, the module can be transferred using three stands only, whereby one of the stands is located at the center of a wall. The wheels of the stands are advantageously standard industrial wheels or rollers. The tightening means can adeptly be a conventional cargo securing strap with a tightening mechanism, while other types of tightening devices offering easy tightening may also be used. If jack-type stands are employed, they can be fixed to the walls of the space module with the help of locking pins or similar locking means whereby the tightening strap is obviated. However, as the encompassing strap provides additional stiffening of the structure, its use is recommendable. Furthermore, the scope and spirit of the invention entails such a transfer system in which the stands are connected to lower points of the module walls or corners than to the upper edge of the module roof, whereby such an arrangement subjects the module walls unnecessary stresses during lifting and transfer. The pivotal joint of the stand about which the stand is pivoted during the lifting operation may be located lower in the stand than at its upper attachment point. Accordingly, the pivotal point may even be close to the center of the stand, but this arrangement necessitates assuring the stability of the stand by suitable locking means.



Claims:

1. A method for transferring a prefabricated space module (13), said method comprising

5

- attaching at least three stands (3) with a wheel (4) at their lower ends to said space module (13), and

10

- lifting said space module (13) onto said stands (3), whereby the module can be transferred on the wheels (4),

c h a r a c t e r i z e d in that

15

- said stands (3) are attached by a pivotal joint at their distal ends with respect to the wheels (4) to the outside of the module (13) so that the distance between the attachment point and the lower edge of the module (13) is smaller than the maximum length of the stand (3) from the attachment point to the extreme lower point of the wheel (4),

20

25

- the module (13) is elevated with the help of the stands (3) to the transfer position by moving the wheels (4) of the stands (3) at least partially below the lower edge of the space module (13) by rotating the inclined stand (3) which is connected to the module by the pivotal joint (7) provided at the upper end of said stand so as to bring the stand more parallel to the module wall adjacent to the stand.

30

35

2. A method as defined in any foregoing claim, c h a r a c t e r i z e d in that the stands are connected to the upper corners of the space element (13).



3. An assembly for transferring a space module (13),
said assembly incorporating at least three stands (3)
comprising

- 5 - an elongated arm (11, 12),

 - a wheel (4) adapted to one end of said arm (11,
 12), and
- 10 - elements (2) adapted at the opposite end of said
 arm (11, 12) relative to said wheel (4) for
 attaching the stand (3) to the space module (13),

c h a r a c t e r i z e d b y

- 15 - members (8) adapted to the outer walls of the
 space element (13) for attaching said stands to
 the module so that the distance between the
 attachment point and the lower edge of the module
20 (13) is smaller than the maximum length of the
 stand (3) from the attachment point to the extreme
 lower point of the wheel (4),

 - a pivotal joint (7) adapted to the upper end of
25 each stand (3), and

 - elements (1, 5, 7) for moving the wheel (4) of
 the stand (3) at least partially below the level
 determined by the lower edge of the space module
30 (13) by pivoting the stand (3) about the pivotal
 joint (7), whereby the module (13) is elevated
 with the help of the stands (3) to the transfer
 position.

- 35 4. An assembly as defined in claim 5, c h a r a c -
 t e r i z e d i n t h a t



- 5 - the length of the stand (3) from the attachment point of the stand to the extreme lower point of the wheel (4) is larger than the distance between the attachment point and the lower edge of the module, whereby the stand remains in an inclined position with respect to the module after the attachment of the stand, and
- 10 - the upper end of the stand (3) is provided with a pivotal joint (7) about which the stand can be rotated toward the module, whereby the module is elevated to the transfer position.
- 15 5. An assembly as defined in claim 7, c h a r a c -
t e r i z e d by a tightening strap (1) adapted to encompass the space module (13) and to pass via the stands (3) so that the stands (3) can be rotated toward the module wall by tightening the strap (1).
- 20 6. An assembly as defined in claim 5, 7 or 8, c h a r -
a c t e r i z e d in that the stands (3) include elements (14, 15) for adjusting the length of the stands.
- 25 7. An assembly as defined in any of foregoing claims 5 -
9, c h a r a c t e r i z e d in that said members (8) of the space element (13) suited to accommodate the attachment of the stands (3) are adapted to the upper corners of the module.
- 30 8. An assembly as defined in any of foregoing claims 5 -
10, c h a r a c t e r i z e d by a separate frame structure suited to accommodate the connection of the stands (3) to the space element (13).