A method and a building system for manufacturing a floating structure, for instance a watercraft, in which method the hull part for the floating structure is formed, it is provided with deck structures or similar support structures, and space units are prefabricated and installed between said deck structures or similar support structures. In the method such space units are manufactured, which comprise engineering units, which are provided at least with WC-equipment, as well as room units so that an engineering unit interconnected with a room unit forms a cabin unit. The engineering units of two adjacent cabin units are prefabricated and joined together to form an engineering unit pair and the thus accomplished engineering unit pair is transferred to and installed in its place on the floating structure. Further, the floating structure is provided with a number of vertical support elements, such as stanchions, to be installed between the deck structures, preferably prior to the installation of the engineering units.
METHOD AND BUILDING SYSTEM FOR MANUFACTURE A FLOATING STRUCTURE

[0001] The present invention relates to a method in accordance with the preamble of claim 1 of manufacturing a floating structure, for instance a watercraft, in which method a hull part for the floating structure is formed, it is provided with deck structures or similar support structures, and space units to be installed between said deck structures or similar support structures are prefabricated.

[0002] Various ways of installing cabin units into a watercraft or the like are known from prior art. Originally, the cabin units were generally located within the hull. EP 1808781 A1 discloses a solution, where the sanitary cabins, i.e. WC and shower units, of two adjacent cabin units are interconnected and can be transferred and installed as one pre-furnished unit. The cabin spaces related to these sanitary units are, instead, built on site onboard the watercraft around the sanitary cabins. Thus, an essential part of the manufacturing and installation of the cabins is, according to this solution, still performed onboard.

[0003] Later on, more or less prefabricated self-supporting cabin units have been introduced, whereby the cabin units have been transported from the manufacturing plant to the site and moved aboard the watercraft to be finished and coupled with the various systems, such as the HVAC systems, of the watercraft. Previously known solutions are for instance the installation of so-called bottomless cabin unit disclosed in U.S. Pat. No. 4,528,928, and the one disclosed in U.S. Pat. No. 4,959,933, where the dimensions of the cabin unit can be reduced for transport and transfer to the mounting site.

[0004] The general trend is to try to avoid additional installation work on the watercraft itself in uncomfortable circumstances and to move most of the prefabrication of cabin units and cabin equipment as well as of the installation work to plant conditions. Consequently, it has been realized that also the integration of elements included in the immediate environment of cabin units may as well be carried out, as required, in conjunction with the prefabrication of cabin units. Thus, it has been possible to equip cabin units e.g. with balconies and/or elements facing the cabin corridor, as is disclosed e.g. in WO2004/041633 A1.

[0005] On one hand there is a general tendency related to watercrafts, i.e. to reduce the weight of the watercraft and/or to lower its centre of gravity, whereby the stability of the watercraft can be improved and it is possible to manage with less propulsion power. On the other hand, this gives also the opportunity to increase the number of decks and thereby the number of cabins and the passenger capacity. The reduced weight may be accomplished by shortening the distance between the decks on the watercraft and/or by decreasing their number. An example of the former is disclosed in F120030352, where the upper parts of the cabin units are lifted so that they are located between the deck beams, and the lead-ins of various pipes and cables are arranged individually on each deck in a suitable manner so that the number of through-holes in the deck beams can be minimised, whereby the deck beams may be made lower without compromising on their strength properties. As for the latter, an example is disclosed in the above-mentioned WO2004/041633 A1. In an arrangement according thereto every second deck may completely omitted.

[0006] A purpose of the present invention is to provide a novel solution, by means of which the prefabrication and outfitting of cabin units may to an increasing extent be moved to better circumstances on plant, and thus to further minimise the installation work carried out on watercrafts, often in hard conditions. A purpose is also to enable the lowering of the deck height or the centre of gravity of watercrafts as well as to improve the utilisation of cabin units and the spaces related thereto. Further, a purpose is to improve the use of materials and to simplify and speed up the installation of cabin units onboard the watercraft.

[0007] The purposes of the invention can be achieved in the manner disclosed in claim 1 and more precisely in the other claims. In the method according to the invention, space units are manufactured comprising engineering units and room units so that an engineering unit interconnected with a room unit makes a cabin unit. The engineering unit is provided at least with WC-equipment and a passage to its respective room unit. The engineering units of two adjacent cabin units are prefabricated and connected to one another to form an engineering unit pair and the thus accomplished engineering unit pair is transferred to and installed in its place on a floating structure. Engineering unit pairs are arranged successively within the deck structure so that they abut onto a cabin corridor and define the width of the cabin units facing the cabin corridor. In addition, the floating structure is provided with a number of vertical support elements, such as stanchions, to be installed between the deck structures preferably prior to the installation of the engineering units.

[0008] According to the invention, by joining the engineering units of adjacent cabin units together to form an engineering unit pair it is possible to move the prefabrication and installation work to a considerable extent to better conditions on manufacturing plants. The engineering unit pair may be provided with various common elements, the coupling means of each individual cabin may be mounted in advance and the unit may also be equipped with elements for the immediate environment of the cabin units. Moreover, an engineering unit pair is easier to transfer to and install in its place between the stanchions than an entire cabin unit. This, among other things, enables the changing of the mutual distances related to deck beams and their vertical support elements so that the deck height can be reduced and/or space utilisation improved.

[0009] The room units for the engineering unit pair are prefabricated and transferred into their places preferably as one unit and connected to the engineering unit pair as well as to the deck structures or similar support structures of the floating structure. The room units may thus also be furnished in advance and provided for instance with a window and/or a balcony, if required.

[0010] In the practical installation work preferably at least the majority of the engineering unit pairs of the cabin units of a particular deck structure are transferred to and installed first in their places on the floating structure and thereafter the respective room units are transferred to and installed in their places to provide cabin units. Further, the cabin units are preferably arranged in rows within the deck structure so that a corridor is formed between the rows. Then the deck beams or the like included in the deck structure may preferably be supported by said vertical support elements at two different points on different sides of the corridor. Due to the accomplished additional support, the deck beams itself may be made lower, without compromising on the strength properties, than in a traditional arrangement, where the deck beam is sup-
ported only at one point. By changing the heights of deck beams and by changes in the clear span it is possible to affect also the natural frequencies of the structure and thereby the various vibrations and shakings, which is an important factor from the viewpoint of travelling comfort. [0011] In practise, said vertical support elements are preferably installed so that they are located between an engineering unit and a room unit, when they are installed in place. For this purpose, the engineering units of an engineering unit pair are equipped with a recess in the wall for said vertical support element. This is advantageous in terms of space utilisation and does not disturb the installation of space units prefabricated according to the invention. The vertical support elements are most preferably mounted in advance prior to the installation of space units. In principle it is, as well, possible to install them or a part of them also afterwards, e.g. after a part of the cabin units has already been brought onto the watercraft, in which case they are welded onto the deck structure and deck beams. This might, however, result in damages to the cabin unit as well as in a higher fire safety risk. The installation of support elements also delays the outfitting work carried out outward.

[0012] The engineering units of an engineering unit pair may preferably be equipped with a common partition, which tends to reduce the weight of the structure. Other elements possibly shared by adjacent cabin units are e.g. an air-conditioning unit. In addition, the engineering units of an engineering unit pair are equipped with a passage to their respective room units and with an entrance door from the cabin corridor to a cabin unit. Then the engineering unit preferably defines the width of the entire cabin unit facing the cabin corridor. Thus at the same time, the successively installed engineering units preferably form the wall of the cabin corridor, whereby the engineering unit pair may be further equipped with a pre-installed furnishing wall facing the cabin corridor and a common service space opening to the cabin corridor. In the service space it is possible to install various kind of equipment for coupling a cabin unit and/or the cabin corridor with the different systems of the floating structure, such as the air conditioning, electrical supply, water supply, and grey and black water discharge system, and for providing vertical loadings for these systems as required. Then, the wall of the cabin corridor is preferably equipped with a service door to the service space. By these measures the items in the cabin unit requiring service may be installed in advance so that they are easily accessible and the service may be performed from the service space, whereby there is no need to use the other spaces of the cabin unit separately for this purpose.

[0013] The engineering units and the ceiling structure integrated with them are preferably made lower than the room units in the vertical direction, whereby the space above the engineering units and/or the ceiling structure of the corridor is available for instance for heating in and coupling the pipes, conduits and cables of the HVAC systems with the cabin units individually on each deck. Accordingly, the room units may be made higher and their ceiling may be provided, in a manner known per se, with foldable beds etc.

[0014] The present invention also relates to a building system according to claim 12 and a floating structure according to claim 23 with respective dependent claims.

[0015] In the following the invention is described by way of example with reference to the attached drawings, in which

[0016] FIG. 1 illustrates the traditional way to install cabin units on a watercraft or a similar floating structure;

[0017] FIG. 2 shows a side view of the differences between a traditional prior art solution and the technical solution according to the invention and the impact of these on the mutual distances between the support structures, i.e. on the module pitch;

[0018] FIGS. 3-5 show, step by step, how the space units are installed and assembled in place on a floating structure in order to provide cabin installation, and

[0019] FIG. 6 shows the structure of the cabin area assembled and installed according to the invention seen from above.

[0020] Traditionally, the transfer and installation of cabin units onto a watercraft or the like is carried out in the way shown in FIG. 1. Accordingly, prefabricated self-supporting cabin units 1 provided with a WC unit 1a and an entrance door 1b are brought one by one, as shown by the arrows, between the watercraft’s outboard structure 2, inner support structure 3 and the vertical stanchions 5 of deck beams 4, into their places on the deck 19 of the watercraft. Conventionally, only every second deck beam 4 is supported by a stanchion 5 in order to facilitate the installation of the cabin units 1. There may be, as known per se, several decks on the watercraft and they are supported by means of said parts 2, 3, 4 and 5, and in addition, deck beams in the longitudinal direction of the watercraft, which are placed transversely with respect to the deck beams 4, as shown in the figures, are used. The rest of the watercraft’s structure is not shown in detail, as it is not as such relevant to the application of the invention.

[0021] The cabin units 1 are installed in rows on the deck 19 so that a cabin corridor 6 is formed between them and the pitch of the cabin units is determined by said deck beams 4 and on the other hand, by the stanchions 5. The cabin unit 1 is adapted into the outboard structure 2 by means of a lining 7. Every cabin unit 1 is then coupled separately with the systems of the watercraft, e.g. the HVAC systems, which are not for the sake of clarity shown here separately. The aim is to provide these various couplings by utilising, in the service space 10, known per se, arranged between the cabin units. The ceiling of the cabin units may be brought into its place at the same time or it may be mounted separately between the deck beams 4. Further, the lining of the cabin units on the corridor’s side is carried out on site by installing furnishing walls and ceiling boards as well as other technical equipment required by the corridor, e.g. lighting and air conditioning (not shown in detail), between the cabin units and the corridor. In addition, the linings 7 against the watercraft’s outboard structure 2, possible balcony assemblies etc. are provided.

[0022] FIG. 2 illustrates the differences between an old and new installation method and system. The upper part of the figure shows the old method, whereby the module pitch parallel with deck beams is determined by the position of the stanchion 5. The lower part of the figure, which is according to the invention, shows that a cabin unit 1 is for prefabrication and installation divided into separate engineering units 9 and room units 8, whereby the stanchions 5 have been mounted on the deck 19 so that they may be placed between the engineering unit 9 and the room unit 8 and not in conjunction with the cabin corridor 6 between the cabin unit rows, as was the case earlier. The module pitch has thus changed and the deck beam 4 is supported at two points by the stanchion 5. Consequently, the deck beam 4 may be made lower without compromising on the strength of the support, as the span is shortened as well. Moreover, the engineering units 9 according to the invention
are made lower, whereby the space above them may be used for leading the pipes 15 and cables 16 of various systems into the cabin units 1 on each deck, as is shown in more detail in FIG. 6. Accordingly, the room unit 8 may be made higher, whereby the extra room may advantageously be used e.g. for installing so-called Deck Fullman beds 17. In addition, for instance a ceiling dome provided with decorations 18 may be, if desired, lifted afterwards into the space between deck beams above the ceiling surface of the room unit. If, on the other hand, there is no need to heighten the room units 8, the deck height may be reduced as well, whereby the height of the watercraft can be lowered. Alternatively, the number of decks may be decreased whereby more cabin units can be provided on the watercraft and thus the passenger capacity increased.

[0023] FIG. 3 shows the basic idea according to the invention of joining together and prefabricating the engineering units 9 of two adjacent cabin units to form an engineering unit pair 12, which is then transported and moved to its place between stanchions 5, as is shown by the arrow. As illustrated in FIG. 3, both engineering units 8 of the engineering unit pair 12 comprise a Wc-unit 9a, corridor 9b, passage 9c to the room unit of the cabin unit and a recess 9d for the stanchion 5. In addition, the engineering units 9 have a common partition 9e. The engineering unit pair 12 is also provided with a service space 10, in which accessories and equipment related to the cabin units, such as pipes, cables and conduits for coupling the units to the systems of the watercraft and/or to make them a part of the relevant systems, may be installed. The cabinet units may also have e.g. a common air conditioning unit, which is connected to the engineering unit pair 12. Further, the engineering unit pair 12 may preferably be in advance provided with a furnishing wall 11 to be adapted to the cabin corridor 6. This may be preferably provided also with technical equipment for the corridor, such as the installation of fire fighting equipment, lighting, communication system etc.

[0024] As shown in FIG. 4, the engineering unit pair 12 for the cabin units at least within a certain area on a particular deck of the watercraft are transferred to and installed in their places between the stanchions 5. Between the successively installed engineering unit pairs 12 remains a cabin corridor 6. Naturally, the basic idea according to the invention may as well be applicable in a case, where only one cabin unit row abutts onto the cabin corridor 6. After this, the room units 8 for the already installed engineering unit pairs 12 are transferred to and installed in their places. The room units may be transferred one by one, but preferably in pairs, as shown by the arrows, since the pitch of the stanchions 5 and the selected tolerances make this possible. Independently of the embodiment shown in the figures, the room units 8 may also be made unequal in size, if so desired.

[0025] Further measures to be taken in the installation area will be provided in the manner shown in FIG. 5 so that the room units 8 for each engineering unit pair 12 are provided with linings 7 against the outboard structure 2, the joining points 13 of the units' wall elements are finished, and the technical couplings 14 on the house deck surface between the room unit 8 and the engineering unit 9 are provided. Subsequently, the ceiling structures of the cabin corridor 6 as well as the pipes 15, cables 16 etc. to be arranged on top of them and on top of the space 20 above the engineering units are installed, as is described in the foregoing and shown in FIG. 6. On the other hand, an effort can be made to install this equipment in place already before the components of the cabin units are brought in, whereby the installation thereof is easier. The sidewalls of the cabin corridor 6 are provided by installing furnishing walls 11 onto each engineering unit pair 12, as is described earlier on.

[0026] The invention is not limited to the above-described embodiments, but several modifications are conceivable in the scope of the appended claims. The prefabrication degree of the room units, among other things, may be chosen, if required, so that the room units are provided e.g. with furniture, a window, balcony etc. already prior to the transfer of the room units into their places, if so desired or required by the situation. Similarly, the engineering units are preferably outfitted as completely as possible in advance in order to minimise the installation work carried out onboard the watercraft. Thus, the engineering unit is provided in advance preferably at least with sanitary facilities, a service space with equipment and technical couplings for the cabin unit. Further, the engineering units can in principle also be installed so that they are not actually located between the stanchions, but the stanchions remain between the engineering unit pair and the room units in the cabin unit's centre section.

1-32. (canceled)

33. A method of manufacturing a floating structure, comprising:
providing a hull part having support structures for cabin units each composed of an engineering unit and a room unit,
providing a prefabricated engineering unit pair comprising two engineering units for serving the room units of two adjacent cabin units, each engineering unit of the engineering unit pair including at least Wc-equipment, and placing the engineering unit pair in the hull part and transferring the engineering unit pair as a single unit to a desired position in the hull part where the engineering unit pair abuts onto a cabin corridor, and wherein each engineering unit defines a passage space for leading from the cabin corridor to its respective room unit.

34. A method according to claim 33, comprising:
providing two prefabricated room units, placing the prefabricated room units in the hull part and transferring each room unit to a desired position in the hull part where the room unit can be connected to a respective engineering unit, and connecting the room units to the respective engineering units and to support structures of the floating structure, whereby the two room units and the respective engineering units form two adjacent cabin units.

35. A method according to claim 34, comprising transferring the room units as one unit to the respective desired positions in the hull part.

36. A method according to claim 34, wherein the engineering unit pair is of an extent lengthwise of the cabin corridor substantially equal to that of said two adjacent cabin units.

37. A method according to claim 33, wherein the support structures include a lower deck structure and an upper deck structure above the lower deck structure, and the method comprises installing vertical support elements between the lower deck structure and the upper deck structure and subsequently placing the engineering unit pair on the lower deck structure.

38. A method according to claim 37, wherein the upper deck structure includes a deck beam extending transversely of
the cabin corridor and the method comprises installing first and second vertical support elements between the lower deck structure and said deck beam at first and second locations respectively such that the cabin corridor is between the first and second locations.

39. A method according to claim 38, wherein the desired position of the engineering unit pair is between the first vertical support element and the cabin corridor.

40. A method according to claim 39, further comprising: providing two prefabricated room units, and placing the prefabricated room units in the hull part and transferring each room unit to a desired position in the hull part where the room units can be connected to the engineering unit pair at the first location between an engineering unit and a room unit.

41. A method according to claim 33, wherein the cabin corridor has first and second opposite sides and the method comprises installing first and second engineering unit pairs adjacent one another lengthwise of the cabin corridor and at the first side of the cabin corridor, installing third and fourth engineering unit pairs adjacent one another lengthwise of the cabin corridor at the second side of the cabin corridor, and confronting the first and second engineering unit pairs across the cabin corridor, and subsequently installing first, second, third and fourth pairs of room units and connecting the first, second, third and fourth pairs of room units to the first, second, third and fourth engineering unit pairs respectively.

42. A floating structure, comprising:
   a hull structure having support structures for cabin units each composed of an engineering unit and a room unit, a prefabricated engineering unit pair abutting onto a cabin corridor and comprising two engineering units for serving the room units of two adjacent cabin units and at least one common element for serving both adjacent cabin units, and each engineering unit of the engineering unit pair including at least WC-equipment,
   two prefabricated room units positioned adjacent the engineering units respectively, each engineering unit defining a passage space leading from the cabin corridor to its respective adjacent room unit, whereby each engineering unit and the adjacent room unit form a cabin unit, and the two adjacent cabin units are of substantially the same extent lengthwise of the cabin corridor as the engineering unit pair.

43. A floating structure according to claim 42, wherein the support structures include a lower deck structure and an upper deck structure above the lower deck structure, multiple cabin units are positioned on the lower deck structure in first and second rows, the cabin corridor is formed between the first and second rows, the upper deck structure includes a deck beam extending transversely of the cabin corridor, and the support structures further include first and second vertical support elements between the lower deck structure and said deck beam at first and second locations respectively such that the cabin corridor is between the first and second locations.

44. A floating structure according to claim 42, wherein the support structures include a vertical support element located between an engineering unit and a room unit.

45. A floating structure according to claim 42, wherein each engineering unit of the engineering unit pair has a wall formed with a recess for accommodating a vertical support element.

46. A floating structure according to claim 42, wherein the engineering units of the engineering unit pair have a common partition.

47. A floating structure according to claim 42, wherein each engineering unit has an entrance door from the cabin corridor to the passage space.

48. A floating structure according to claim 42, wherein the engineering unit pair includes a pre-installed furnishing wall facing the cabin corridor.

49. A floating structure according to claim 42, wherein the engineering unit pair includes a common service space opening to the cabin corridor for installation of equipment for coupling the cabin units or the cabin corridor with utility systems of the floating structure and for providing vertical lead-ins for connection to the utility systems.

50. A floating structure according to claim 49, wherein the cabin corridor has a wall equipped with a service door providing access to the service space.

51. A floating structure according to claim 42, wherein the engineering unit pair is smaller in height than the room unit, whereby a space above the engineering unit is available for leading in and coupling pipes, conduits and cables of utility systems with the cabin units.

52. A floating structure according to claim 42, wherein the support structures include vertical support elements and the engineering unit pair is installed between said vertical support elements.

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