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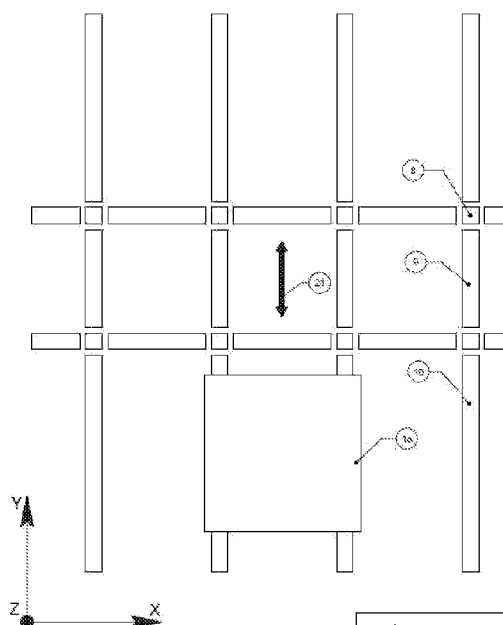


FIGURE 1

(57) Abstract: A electrical driven carriage (1) for moving loads on a floating vessel in a pre-defined pattern such as skid rails. The electrical driven carriage is characterized by a mechanism that is used to lower and raise the drive units as such to engage with the skid rails and control the friction in the system to avoid unintentional movement. Further the invention is characterized by using electrically speed controlled motors to create the movement on the said skid rails.

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Electrical Retrofit Skidding System

AREA OF THE INVENTION

Area of invention: The invention concerns an electrical system used for supporting loads and moving loads along at least one set. E.g. Pair of rails (also known as skid beams) for a floating vessel.

For example, the vessel may be comprised of a boat or a floating installation. As example the vessel could be an offshore construction vessel (also known as OCV), Inspection Maintenance and Repair vessels (also known as IMR) anchor handler (also known as AHTS), Riserless Light Well Intervention vessel (also known as RLWI), drilling rigs, drill ship or similar using one or more carriages (also known as pallets or carts) for supporting loads and moving the loads along the rails. The invention further relates to a method of transporting loads on a offshore installation or vessel.

It is to be possible, by means of the present invention, to carry out a fast and controlled movement of the carriage from a storage position to an operating position and/or vice versa. Without risk of damage to personnel or equipment. The electrical skidding system shall be of retrofit type to allow for installation on existing vessels without any major modifications required. The said electrical skidding system shall be remotely operated and may use battery or external power through a cable.

BACKGROUND

Background of the invention. The back ground of the invention is the demand for more efficient and environmental friendly solutions offshore. Clients typically oil companies are often describing CO2 footprint of a vessel and in this context more and more equipment will have a demand of going from hydraulic to electrical system such as electrical winches and battery packages on vessels to save fuel. One of the areas where electrical solutions are limited in design and extremely expensive to install are electrically skidding system.

In modern skidding systems, the handling of loads, such as subsea modules or heavy weight structures (e.g. Xmas trees, process modules, jacket foundations, PLEMs), on open deck demands a high degree of safety for both equipment and personnel. Existing deck skidding systems typically comprise integrated or on-deck skid rails, push-pull, rack and pinion or winch driven carriages. Lay-out and integration with other systems are preferably optimized for efficient deck logistics. Most skidding systems used today are extremely inefficient and such operation often takes hours to perform.

It is an object of the present invention to provide a more versatile, flexible and efficient skidding system, and are retrofit into existing skid rails. Typically skid rails are having T-beam profile at the top flange and may have crossing rails enabling skidding in both X-Y direction, or longitudinal and transverse when referring to vessel orientation.

During offshore operations weather is often a limiting factor for when carriages and skidding systems is used. Direction of weather often changes during the time between mobilisation and reaching the installations site, weather forecast is also often inaccurate. Due to this the operation often have narrow weather windows that allows such operation to proceed and having an efficient system for securing the carriage and moving the carriage from parked position to new position is vital.

It would therefore be desirable to have an efficient system for changing the positions of the modules and carriages in a safe and simple manner when at sea. It would also be desirable that any solution does not require any significant changes to the vessel design or apparatus.

In a first aspect of the invention there is to provide a carriage for use on the existing skid rails of a vessel, said pallet comprising a supporting means, a mounting means, for the mounting of an load/object thereon, and at least one electrical actuation means included in the carriage frame members to interface with the skid rails to move the carriage in relation to the said skid rails.

If required or desired the, vessels may be provided with several electrical driven carriages for moving of more than one load at the time.

To this end, at least one, preferable all, of the carriages is (are) adaptable to different loads, the electrical driven carriages may have at least on, or more carriages attached to in a train.

In this first embodiment the carriage is self-supported by using electrically stored energy to move the carriage from parked position to new position. It is possible when required to recharge the electrically stored energy when required.

In this second embodiment no electrically, energy is stored in the carriage but the energy is provided through an electric cable, directly to the motor control units

According to third embodiment the electric energy is transferred into mechanical energy through one or more electric motors. The motors are controlled through a motor controller that controls the torque and speed of the motor.

In this fourth embodiment the electrical motor(s) are used to move a wheel, belt or similar device used to transfer the mechanical torque by using friction between the static skidding rails and the rotating part.

In this fifth embodiment the carriage(s) include a device and system for controlling the friction between the moving part and the static skidding rails.

-Such system could be a device that increased the friction between the static and moving part.

- a system that increases friction or stop the carriage if friction force is less than the moving force. Such as a breaking caliper typically used on motor vehicle.

In this sixth embodiment, which is also useful with carriages which is not electrically driven, the carriages comprise one or more fasteners for securing the loads to the carriages. The fasteners provide e.g. a friction lock or a positive lock, e.g. by means of a pin or studs that in the locked state of the fastener extend through or in the load. In a refinement, the fasteners are mounted on or integrated in a support or supports.

In seventh embodiment, the at least one electrically driven carriage comprises one or more devices for securing the carriage itself with or without load to the skidding rails of the vessel in all directions.

In eight embodiment the carriage includes a system for elevation of the carriage such that the wheels/belts or part that moves the carriage in relation to the static skidding rails can be engaged and friction increased between the static part and the moving part.

In ninth embodiment the carriage includes a system for orient the wheels/belts in direction 90 degrees of the first direction, or have wheels/belts in fixed orientation in a 90-degree direction to the first wheel/belt. When engaging the wheel/belts in this direction the carriage can move in this said direction.

As explained in US 3, 486, 737, when it is desired to move a heavy load on a support in a straight line or in an arc, the moving sometimes is done by skidding the load. For example, when drilling wells from a platform at sea it is customary to skid the drilling rig on the platform from one well location to another. This is commonly done by means of double acting hydraulic cylinders that skid the rig in a series of short steps, between which the pistons are retracted in the cylinders for the next stroke

US 3,033,525 also addresses skidding and relates to a force-transmitting device for moving one member relatively to another,

DE 10 2008 020965 relates to a device and a method for assembling and servicing underwater power stations, In an example, the "crane system 9 transfers the machine gondola 4 to a supporting device 10. Said device consists predominantly of two supporting devices 10.1, 10.2, which may run on a common guide rail system 11 along the deck of the barge 8. In the diagrammatic illustration of figure 1 the supporting device 10.1 and 10.2 include each gripping device 12.1, 12.2, with which the assembly components 13.1, 13.2 in a partially disassembled machine gondola may be run and positioned against one another along the guide rail system 11."

WO 2007/069081 relates to a skidding pallet for use on the skid rails of a vessel, the pallet comprising a supporting means such as a frame, a mounting means for the mounting of an object thereon, and at least one actuation means, such as a cylinder, attached to one of the supporting means or mounting; means. In use, the supporting means interfaces with the skid rails and the actuation means are actuatable to cause the mounting means to rotate in relation to said supporting means and the skid rails.

EP 2 444 656 relates to a securing member suitable for securing a heavy load, in particular a component of a wind turbine on a transport element, with at least one bolt element.

EP 2 559 614 relates to a "vessel { 1} for removal and/or installation of at least a part of a sea platform comprising a support structure and a top side, said vessel comprising a hull { 6) and two support arms (11,12) located at a distance from each other and attached to the hull (6), wherein the support arms in use extend beyond the hull in a substantially horizontal direction,"

US4544135A – The invention describes an improved skidding system of the hydraulic cylinder type is provided having thick cover plates with precut holes therethrough fixed to the tops of skid beams and including claws attached to the ends of the hydraulic cylinders having slidably mounted cylinder pins therein for engagement with the holes through the cover plates to anchor the ends of the hydraulic cylinders as the structure attached to the cylinders is skidded across the cover plates.

US 20160052606 A1 The invention relates to a skidding system for an offshore installation or vessel, such as an offshore wind turbine installation ship, comprising at least one set of rails, and one or more carriages for supporting loads and moving the loads along the rails, e.g. from a storage position to an operating position and/or vice versa. At least one of the carriages is adaptable to different loads.

EXPLANATION OF DRAWINGS

The invention will now be explained in more detail with reference to the drawings, which schematically show embodiments of the skidding system according to the present invention.

Figure 1 shows the plan view of a typical X-Y direction skidding system whereas the skid beams (8), (9) and (10) are arranged in a way such that the carriage (1a) can move in both X and Y direction whereas (21) shows carriage direction Y.

Figure 2 shows in larger scale the carriage (1b) located at a position whereas movement in either X or Y direction is possible.

Figure 3 shows in large scale the carriage (1c) in a position whereas movement in X direction is possible.

The figures are schematic and may somewhat be distorted with respect to relative size and relative placement of components constituting parts of the exemplary embodiments of the invention. In general, identical or corresponding details of figures will be denoted with the same or similar reference numerical in the following.

Exemplary embodiment of the invention figure 1, 2 and 3 shows a typical skidding rail system on a floating vessel. Skidding rails are often made of steel beams (8), (9) and (10) with a T- shaped profile as interface to the carriage. The skidding rails are often arranged in a X-Y pattern corresponding to longitudinal and transvers direction on a floating vessel. The skidding rails shown in figure 1,2 and 3 are schematic and, in practice, may have any suitable lengths.

To prevent the carriage to slide of the skidding rails (8), (9), (10) the carriage is often provided with guides and guide wheels (not shown) at the underside of the carriage. The function of the guides is to keep the carriage on the skidding rails. Directional steering is possible when the carriage is located at a position (1b), whereas the guides then are free to move in any direction.

In first embodiment the carriage (1a,1b,1c,1d) contains a battery package (16), for storage of electrical energy, in third embodiment the carriage (1a) contains a motor controller (17) for controlling the electrical energy transferred to the electrical motor(s) (18). For longitudinal or transvers movement of the carriage the motors (18) may be connected to wheels/belts (2), (7), (4) and (5) or similar mechanism to move the carriage on the skidding rails (8), (9) and (10).

As shown in figure 4, the carriage has a set of wheels/belts (2), (4), (5), (7) oriented in different directions. Among other things the wheel/belts oriented in direction as (5) and (4) are used when moving in one direction. (2) and (7) are engaged when moving in other direction. Furthermore figure 5 explains further embodiment eight where (12a), (13a) and (14a) are lowered as to take the load of the carriage, whereas (15a) is in raised position.

In order to move the carriage across shifting points on skid rails (8) Figure 5 shows arrangement of (12a), (13a) and (14a) when moving across shifting point (8) on skid rails. Wheels/belts arranged in direction (15a) is then raised as to avoid interference with (9) when moving in said direction. The carriage (1a,1b,1c,1d) includes bumper structure (3) to be engaged when the carriage is parked. Moreover, the embodiment arrangements (12), (13), (14) and (15) can be raised and lowered when movement is started or halted, and said lowering/raising is part of the function to increase/lower the friction with the skid rails. System (12), (13, (14), may be provided with sensor device, for example encoders or laser meter structured in a way to monitor the movement of the carriage. The sensors record the movement according to a reference point and exact location of the carriage (1a), (1b), (1c) on skid rails. On the basis of recording the relative movement between the carriage ((1a,1b,1c,1d)) and skid rails it is possible to control the friction by a brake device (20). By doing so, it is also possible to establish distance measurement and corresponding remote operation of the carriage.

If movement of the carriage is said to be faster than the rotational speed of (12a), (13a) or (14a) the brake device(s) (20) will activate and by applying frictional force adjusting the movement to be in correspondence with rotational speed of (12a), (13a) or (14a).

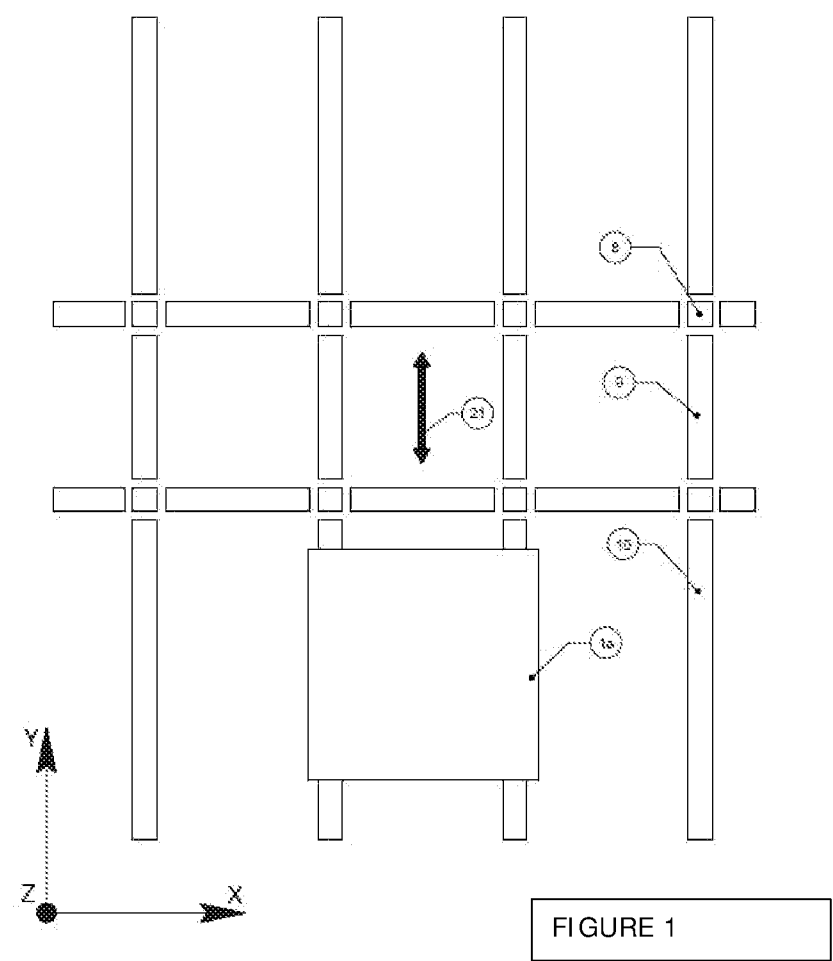
Figure 1 shows the conceptual step of carriage (1a) moving in direction (Y), moreover to start the movement the arrangement of wheels in (Y) direction is engaged by lowering the wheels relatively to the carriage itself until all load are taken be wheels in direction (Y). When carriage (1a) arrives in position (1b), the wheels in direction (Y) are raised and wheels in direction (X) lowered as to take over the load. Wheels in direction (X) will start rotating and move the carriage (1a) to position (1c). When carriage is in final position all wheels are retracted and carriage is resting on bumper(s) (3) with brakes (20) engaged to secure the carriage and load to the skid rails.

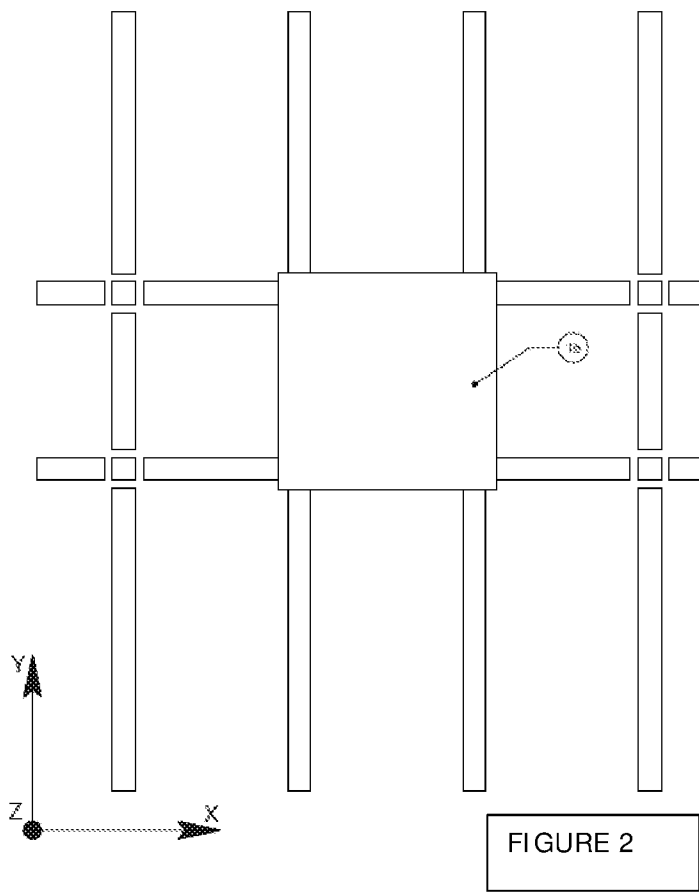
CLAIMS

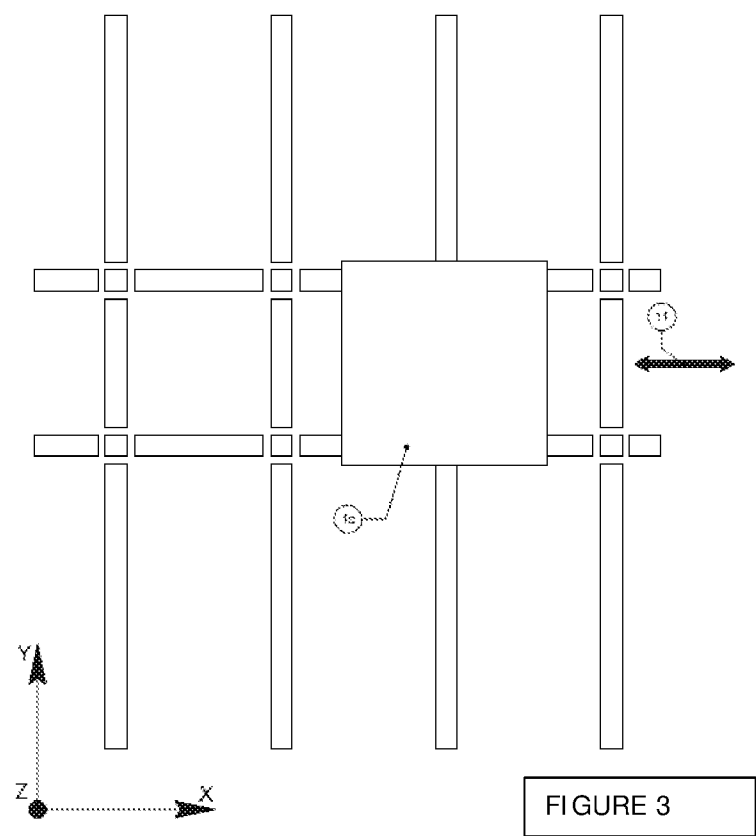
1. A electrical driven carriage (1a)(1b)(1c)(1d) for moving loads on a floating vessel in a pre-defined pattern such as skid rails whereas the carriage comprising:
 - a. At least one carriage (1a)(1b)(1c)(1d)
 - b. Wherein the carriage has electrical drive units (12), (13), (14), for moving the carriage according to the pre-defined skid rail pattern.
 - c. Wherein a mechanism is used to lower or raise the drive units to engage with skid rails and increase the friction between the electrical drive units and skid rails.
 - d. Opposite a brake unit (20) is used to control the relative movement between the carriage and the skid rails.
 - e. Wherein sensors are used to measure the relative movement between the carriage and the skid rails, to use the measurement for controlling the friction.

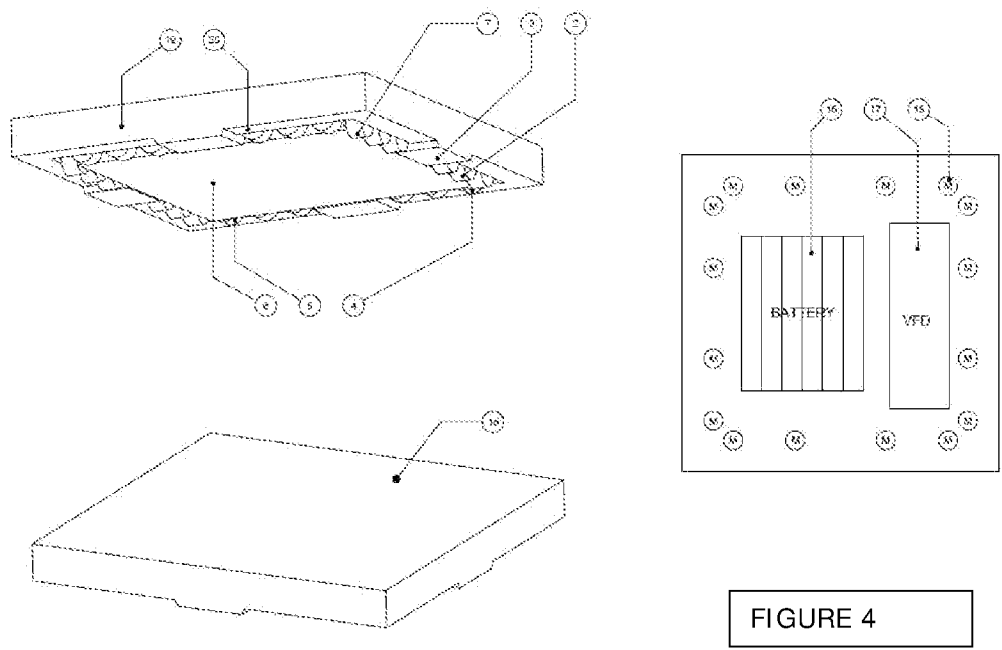
Characterised by;

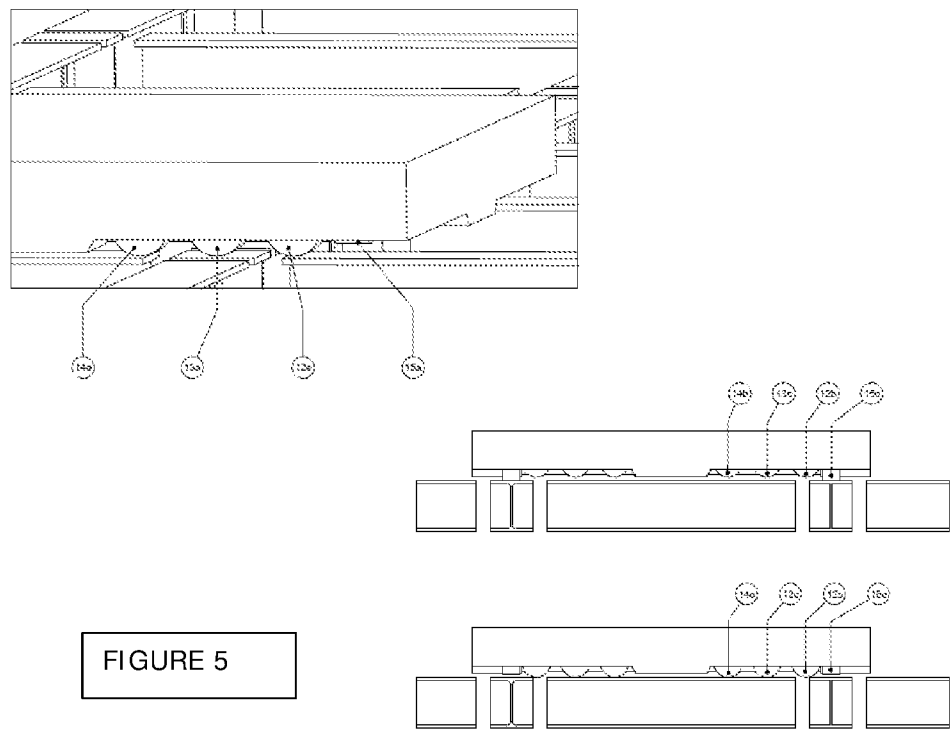
- the carriage is used to transport loads on skid rails
 - at least one electrical connector positioned on the carriage
2. The electrically driven carriage according to claim 1 is characterized with integrated battery package (16) and motor control units (17) for storage and control of the energy.
 3. The electrical driven carriage according to claim 1 and 2 is characterized by having possibility to re-charge the battery package.
 4. The electrical driven carriage according to claim 1,2 and 3 can be remotely and/or automatically operated.
 5. The electrically driven carriage according to claim 1 have brake unit to control the relative movement of carriage to prevent unintended movement due to vessel roll, pitch and heave motions.
 6. The electrically driven carriage according to claim 5 is characterized by using motion response unit and software control to adjust the friction force in the brake unit.
 7. The electrically driven carriage according to claim 1-6 is characterized in that the motion relative to skid rails can be done in all directions.
 8. The electrically driven carriage according to claim 1 is characterized by having a system to secure a load on top of the carriage.
 9. The electrically driven carriage according to any of the claims 1-8 can be used without having integrated battery package and motor control unit, this function can be stored elsewhere.











INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER		
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B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) B63B; B65G		
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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, WPI, FULL TEXT: ENGLISH, GERMAN, FRENCH		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	NO 343804 B1 (EXCESS ENG AS) 2019.06.11 Claims 1-9; description and figures	1-9
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Information on patent family members

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Patent document cited in search report / Publication date		Patent family member(s) / Publication date	
NO 343804 B1	2019.06.11	NONE	