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(54) Title: DRILLING RIG SYSTEM

(57) Abstract: The disclosure relates to a drilling rig system, particularly a land-based oil-well drilling system. The system comprises a rig module (1) which is adapted to perform drilling operations, and a setback module (2) which is adapted to hold stands (3) of drill pipe and/or drill collars to be used during the drilling operations. The disclosure further relates to a setback module (2) for use in connection with a rig module (1) in a drilling rig system, as well as a method for operating a drilling rig system.

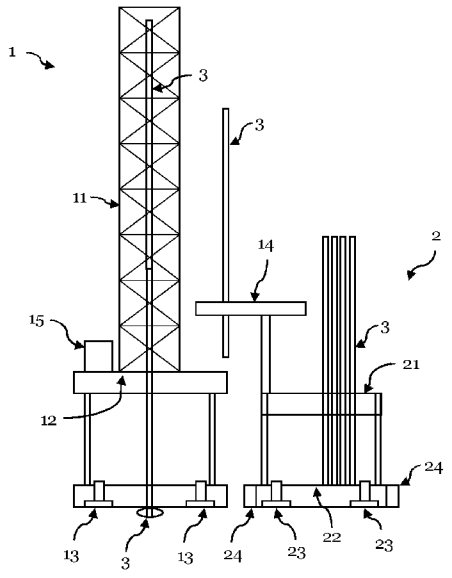


Fig. 2

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DRILLING RIG SYSTEM

Technical field

The present invention generally relates to a drilling rig system, in particular to a land-based oil-well drilling system. The invention further relates to a setback module, and a method of operating a drilling rig system.

Technical background

The production of oil and gas typically requires the use of drilling rig systems. A drilling rig, or rig, is used to drill a well or bore in the earth's subsurface, for example up to 45.000 ft (13.716 m) deep. A drilling rig typically includes all components necessary for drilling, including a derrick or mast, the drill string, and the power generation equipment. The drill string comprises drill pipes which can be tubular steel conduit fitted with threaded ends called joints. Fig. 1 illustrates such a drilling rig 1' of the prior art.

During drilling operation, it is often necessary to pull the drill string out of the bore or to replace it in the bore. This operation is often referred to as tripping pipe. A pipe trip can be necessary when the drill bit needs to be replaced. When removing the drill string from the bore, every e.g. third drill pipe or drill collar connection is unscrewed. Such compound of several joints of drill pipe or drill collars that remain screwed together during tripping operation is often referred to as drilling stand or stand. A stand is preferably 90 ft (27,4 m) in length. The stands are then placed vertically on the drilling rig, on a platform often referred to as the pipe setback or setback, which is typically a part of the drill floor. With reference to the prior art system illustrated in Fig. 1, the stands 2' are placed on the setback 3'. The setback is typically made of a metal frame structure with wood elements to protect the ends of the drill pipes. Handling stands of drill pipe instead of unscrewing every drill pipe increases efficiency during tripping pipe operations.

Once a well has been drilled, it is often desired to move the drilling rig away from the drilling side to drill another bore at another location. This requires dismantling the drill string, and also a dismantling of all the stands stored in the setback. The single drill pipes are then removed one by one from the drilling rig. This operation may include lowering all dismantled drill pipes horizontally on a pipe rack by means of a catwalk, and loading the drill pipes by means of a crane on a truck to move them to the new drilling location. At the new drilling location, the drill pipes are lifted to the pipe rack, loaded one by one to the drill floor and reassembled to form the stands, which are then stored in the setback. The effort for moving typically hundreds drill pipes in this manner is huge.

It is therefore an object of the present invention to provide an improved drilling rig system. Particularly, it is an object of the present invention to provide an improved drilling rig system which allows for an efficient relocation thereof. Manpower and time is desired to be reduced during drilling rig relocation operations.

These and other objects, which become apparent from the following description, are solved by a drilling rig system according to claim 1, a setback module according to claim 16, and a method for operating a drilling rig system according to claim 17.

Summary of the invention

A first aspect of the invention relates to a drilling rig system, in particular to a land-based (onshore) oil-well drilling rig system. The person skilled in the art will recognize that the inventive concept may also be used in connection with offshore rig systems. The drilling rig system comprises a rig module which is adapted to perform drilling operations. For this purpose, the rig module may comprise the derrick or drill mast, the power generation equipment, the drill floor located under the derrick or drill mast, and further equipment for drilling operations.

The drilling rig system further comprises a setback module adapted to hold the stands of drill pipe (pipe stands) and/or drill collars (collar stands) to be used during the drilling operations. During tripping pipe operations, for example, the stands are placed in the setback module and not on the rig module. Accordingly, the rig module is

preferably free of any setback area, i.e. free of an area adapted and reserved for storing drill stands. The setback module may comprise a fingerboard adapted to secure the stands. Preferably, the setback module comprises two or more stand fixation fingerboards, particularly preferred five stand fixation finger boards. This may provide for high security. The setback module may comprise further fixation means adapted to securely fix the stands in the setback module allowing for a secure transport of the setback module while holding the stands as will be described in the following. Preferably, the setback module may be equipped with an elevator allowing for transferring the stands. The setback may comprise a metal frame structure with wood elements to protect the ends of the drill pipes.

According to the invention, the setback module is separate from the rig module. That is, the setback module is not fixed to the rig module, and is not an integral part of the rig module. Instead, the setback module can be moved independently from the rig module. Preferably, the setback module is adapted to be movable separately from the rig module while the setback module is holding the stands. The inventors have found that by splitting the rig and setback structures of the drilling rig, it is possible to relocate the drilling rig in an efficient manner: The drilling rig system can be relocated without having to dismantle the stands. Instead, the setback module including the stands stored therein can be moved independently from the rig module.

As a dismantling of the stands is not necessary any longer when relocating the drilling rig system according to the present invention, overall security is increased as the risk of injuries and working at height during such dismantling procedures is eliminated. Further, manpower and operation time are saved. Particularly, when the drilling rig system is configured as a cluster well rig system, fast movement thereof is enabled. As a further advantage, it is possible to efficiently use the setback module in connection with several rig modules. That is, the setback module can be used for drilling operations by different rig modules successively or simultaneously.

The term “module” used herein does not imply that the respective module is necessarily a single-part component. A module, e.g. the rig module or the setback module, can each comprise several modules which may be detachably or permanently connected to each other.

The setback module is preferably configured for assembling and/or dismantling stands independent from the rig module. Thus, the stands held in the setback module can be assembled without requiring the rig module. The setback module may comprise the required tools for such operations. It is thus possible, in a preferred embodiment, to load the setback module independent from the rig module, and afterwards move the setback module to the rig module to provide the stands for performing the drilling operations. Similarly, in a preferred embodiment, the setback module including the stands can be moved away from the rig module to then dismantle the stands held in the setback module independent from the rig module.

The rig module is preferably adapted to be movable by means of a rig moving means, preferably a rig moving dolly. Similarly, the setback module is preferably adapted to be movable by means of a setback moving means, preferably a rig moving dolly. That is, the support of the rig module and/or of the setback module may be loadable on and securable to a moving dolly. This allows fast movement of the modules to the next drilling site. The skilled person understands that several moving dollies may be used for moving the respective module.

The rig module preferably comprises rig raising means, e.g. raising cylinders, configured to raise and lower the rig module. Similarly, the setback module preferably comprises setback raising means, e.g. raising cylinders, configured to raise and lower the setback module. In a preferred embodiment, the respective module comprises four raising cylinders located at each corner thereof. With these raising cylinders, the respective module can be raised, such that a moving dolly can be placed beneath the module, and then be lowered onto the moving dolly. After having moved the module to the next drilling site, the module can be raised by means of the raising cylinders such that the moving dolly can be moved away from the module. Afterwards, the module can be lowered on the ground. The raising means may comprise traveling cylinders also used for moving the respective module.

In a preferred embodiment, the rig module and/or the setback module comprises a walking system adapted to move the respective module, preferably independent of the other module. For example, both the setback module and the rig module can both comprise a respective walking system, such that both modules can be moved

independently from each other. Such a walking system, also known in the art as rig walking systems such as e.g. Columbia rig walking systems, are machines operable for transporting heavy loads, upwards of thousands of tons, over a surface area. Walking systems or rig walking systems may be designed as non-wheeled power-driven vehicles fabricated from iron and steel. Such walking systems are exemplarily described in prior art US 2014/0262562 A1. By means of the walking system, it is possible to move the setback module away from or towards the rig module, i.e. in an independent manner. In a further preferred embodiment, also the rig module is provided with such a rig walking system. As will be appreciated by the person skilled in the art, the walking system may comprise elements of the raising means also described herein, e.g. traveling cylinders of the raising means. In other words, the raising means, such as e.g. raising cylinders, may also be used by the walking system to move the respective module.

Preferably, the setback module comprises a grabber system adapted to grab stands held in the setback module. Further preferred, the grabber system is adapted to grab stands held in the setback module and transfer them to the rig module, particularly when the setback module is located adjacent to the rig module. In the same manner, the grabber system is preferably adapted to grab stands of the rig module and transfer them to the setback module, particularly when the setback module is located adjacent to the rig module. The grabber system may comprise any suitable means known to the skilled in the person for grabbing and moving/transferring the stands from the setback module to the desired place at the rig module or reverse, for example during tripping pipe operations. For example, the grabber system may comprise a drill pipe handler, or a manipulator and an end effector.

Particularly preferred, the grabber system is adapted to grab and transfer the stands held in the setback module to the rig module when a distance between the rig module and the setback module is between 1 m and 50 m, preferably between 2 m and 40 m, more preferred between 3 m and 30 m, more preferred between 4 m and 20 m, most preferred between 5 m and 10 m. Similarly, the grabber system is preferably adapted to grab stands of the rig module when the distance between the setback module and the rig module is in the described range. The setback module may also be placed partially beneath the drill floor of the rig module, such that there is no gap between the two

modules. The person skilled in the art understands that the setback module must not be in closest proximity to the rig module, but may be located close to it such that the grabber system can reach the rig system, i.e. such that stands can be transferred to and from the rig system by means of the grabber system. This allows efficient relocation proceedings, as the setback module only needs to be moved to a position close to the rig module. Preferably, any variation in the orientation and/or distance between the setback module and rig module is considered for by the grabber system. Thus, it is not required to place the setback module in a particular orientation and distance relative to the rig module. It is rather sufficient to place the setback module within a suitable distance range and orientation range relative to the rig module, which increases efficiency when relocating the drilling rig system. The setback module may also perform a reorientation procedure if required. By means of the grabber system, stands can be grabbed at the setback module and transferred to the well center, and reverse.

Preferably, the setback module is adapted to hold at least 10 stands, more preferred at least 50 stands, more preferred at least 100 stands, most preferred at least 500 stands. Preferably, the setback module is adapted to hold stands with at least two joints per stand, more preferred at least three joints per stand. Thus, the setback module can store large amounts of stands eliminating the need of providing stand storage area on the rig module. Further, the setback module can hold many stands to provide stands for several rig modules sharing access to the setback module. In a preferred embodiment, each stand comprises three drill pipes each having a length of 30 ft (9,14 m).

Preferably, the setback module comprises a setback floor adapted to support the stands which may be placed vertically in the setback module on the setback floor. Further preferred, the drill floor of the rig module is separate from the setback floor. Thus, the setback floor for storing the stands is not part of the drill floor, but provided separately thereto. In a preferred embodiment, the drill floor and the setback floor may be on the same level. In another preferred embodiment, the drill floor and the setback floor may be at different heights, as the setback floor may for example be provided at a lower position.

A further aspect of the present invention relates to a setback module for use in connection with a rig module in a drilling rig system. The setback module comprises

means for holding the stands of drill pipe and/or drill collars to be used during drilling operations, and means for securing the stands. The setback module is thereby adapted to be movable separately from the rig module. Thus, it is possible to move the setback module together with the stands secured thereto to another location or to a different rig module. It is not necessary to dismantle the stands and unload the single drill pipes or drill collars. Preferably, the setback module comprises a grabber system as described herein.

A further aspect of the present invention relates to a method for operating a drilling rig system as described herein. The method comprises the steps of placing stands of drill pipe and/or drill collars in the setback module, preferably by means of the grabber system, and moving the setback module away from the rig module. Thus, when relocating the drilling rig system, the stands can be moved together with the setback module eliminating the need of a prior dismantling of the stands and unloading the single drill pipes or drill collars.

In a preferred embodiment, the method may further comprise the steps of relocating the rig module, moving the setback module towards the relocated rig module, and using the stands held in the setback module during drilling operations. Since the setback module is already equipped with the drilling stand when being moved towards the relocated rig module, time for assembly of drill stands can be saved. Thus, drilling operations can be initiated after a reduced setup time.

It is to be noted that well rigs of the prior art with an integral and loaded setback cannot be moved, as such structures are typically too heavy to be transported as a whole with loaded stands. At least a movement by means of any fast rig moving system known by the skilled person is impossible. In any case, movement of such structures on an incline is virtually impossible due to the heavy weight and due to the height of the overall structure including the setback on the rig floor, which might cause rig overturning, due to the elevated center of gravity. The split design of the drilling rig system according to the present invention, however, overcomes these disadvantages of the prior art. Splitting the rig module and the setback module leads to a split of the overall weight as well, and the two modules can be handled by means of fast moving

systems, and can even be moved on inclinations. This increases efficiency and flexibility during rig relocation operations.

Description of preferred embodiments

In the following, the present invention is described by means of preferred embodiments with reference to the accompanying drawings. Similar elements are therein described with the same reference signs.

Fig. 1 illustrates a drilling rig system according to the prior art;
Fig. 2 illustrates a drilling rig system according to an embodiment of the present invention;
Fig. 3 illustrates the drilling rig system of Fig. 2 in a different configuration;
Fig. 4 illustrates the drilling rig system of Fig. 2 in a different configuration;
Fig. 5 illustrates the drilling rig system of Fig. 2 in a different configuration;
Fig. 6 illustrates the drilling rig system of Fig. 2 in a different configuration;
Fig. 7 illustrates a setback module according to another embodiment of the present invention in two different views.

Fig. 2 illustrates a drilling rig system according to an embodiment of the present invention. The drilling rig system generally comprises two modules: A rig module 1, and a setback module 2. As is apparent from a comparison with the prior art rig illustrated in Fig. 1, the system illustrated in Fig. 2 is characterized by a split design with the setback being provided as a separate module.

The rig module 1 comprises a mast 11 and a drill floor 12 located under the mast 11. Stands 3 of drill pipe are driven by the rig module 1 into the bore 4. The rig module 1 comprises further equipment 15 necessary for performing drilling operations, as known by the skilled person, such as e.g. power generation equipment. The rig module 1 further comprises rig raising cylinders 13 configured to raise and lower the rig module 1 as described herein.

The setback module 2 is adapted to hold stands 3. Stands 3 are vertically placed in the setback module 2, in a fingerboard 21 and onto the setback floor 22. Although only one

fingerboard 21 is shown in Fig. 2, the person skilled in the art understands that the setback module according to the invention preferably comprises two or more fingerboards, preferably 5 fingerboards. Further, an elevator (not shown) may be provided allowing for a fast loading or unloading of the stands to and from the fingerboard(s). The stands 3 can be secured and fixed to the setback module 2, allowing for moving the setback module 2 including the stands 3 to another location as described herein. Similar as the rig module 1, also the setback module 2 comprises setback raising cylinders 23 configured to raise and lower the setback module 2. Further, the setback module 2 comprises a walking system 24 adapted to move the setback module 2. In a preferred embodiment, also the rig module 1 may comprise such a walking system allowing for a movement of the rig module 1 independent from the setback module 2. As will be appreciated by the person skilled in the art, the walking system may comprise the raising cylinders.

The stands 3 used by the rig module 1 during drilling operations, such as e.g. tripping pipe operations, are stored in the setback module 2. The setback module 2 comprises a grabber system 14 allowing for grabbing the stands 3 held in the setback module 2, and allowing for grabbing the stands of the rig module 1. Upon operation of the drilling rig system, stands 3 held in the setback module 2 may be grabbed by means of the grabber system 14 and transferred to the rig module 1, in order to connect the transferred stands to the drill string extending into the bore 4.

When drilling is complete, it may be desirable to move the drilling rig system to a new drilling site. As a first step, the drill string is removed from the bore 4 and dismantled into individual drill stands 3. The drill stands 3 are then placed, by means of the grabber system 14, in the setback module 2. Fig. 3 illustrates a configuration where all stands 3 are loaded in the setback module 2.

In a further step, it was required in the prior art systems to dismantle the stands 3 and to lay down and remove the drill pipes one by one. With the split design according to the present invention, it is possible to move the setback module 2 including all stands 3 away from the rig module 1. This is done by means of the walking system 24. Once the setback module 2 is sufficiently far away from the rig module 1, as exemplarily

illustrated in Fig. 4, the mast 11 of the rig module 1 may be lowered as known in the art (not shown).

As a next step, the setback module 2 is moved to the new drilling site. This requires securing and fixing the stands on the setback module 2. Subsequently, the setback raising cylinders 23 are actuated to raise the setback module 2. This configuration is exemplarily illustrated in Fig. 5. Afterwards, a moving dolly 25 is placed under the raised setback module 2, as exemplarily illustrated in Fig. 6. Next, the setback raising cylinders 23 are retracted and the setback module 2 is moved to the next drilling site. Although not shown, the rig module 1 is moved to the next drilling site in a similar manner.

After the rig module 1 is placed at the next drilling site, the setback module 2 is unloaded from the moving dolly 24 by extending the setback raising cylinders 23 to raise the setback module 2, removing the moving dolly 24, and lowering the setback module 2. The person skilled in the art understands that rig matts may be placed beneath the modules. Afterwards, the setback module 2 is moved towards the (already relocated or a different) rig module 1 by means of the walking system 24. Subsequently, the stands 3 can be directly unloaded by means of the grabber system 14 in order to use them for drilling operations. An assembly of the stands 3, as done in the prior art systems, is not necessary, as the stands 3 are delivered with the setback module 2 at the drilling location already in an assembled state.

In the prior art, mast lowering operations required dismantling and lowering of all drill stands before the mast could be lowered. According to the present invention, such dismantling and lowering of drill stands is not required, as the setback module can simply be moved separately to the rig module to obtain a sufficient distance before lowering the mast.

Fig. 7 illustrates a setback module 2 according to another embodiment of the present invention in two different views, i.e. in a front and side view (right and left illustrations, respectively). The setback module 2 may be used in conjunction with a rig module as described above with reference to Figs. 1-6. Although not shown, the setback module 2 may comprise one or more elements described with reference to the setback module of

Figs. 1-6, such as, e.g., raising cylinders and a walking system, for the functionality described herein.

The setback module 2 illustrated in Fig. 7 comprises a base structure 26, which comprises two base elements 26a, 26b. For example, raising cylinders and/or a walking system may be mounted to the base structure 26. The setback module 2 may be moved, as described herein, for example by positioning one or more moving dollies under the base elements 26a, 26b.

The base structure 26 supports a support structure 27, on which a grabber system 14 is installed. The base structure 26 further supports a framework which comprises several fingerboards 21. The setback module 2 holds several stands 3 within the fingerboards 21. In the split design of Fig. 7, each base element 26a, 26b supports a framework with five fingerboards 21. The base elements 26a, 26b, in turn, are interconnected by the support structure 27.

Reference signs

1	rig module
2	setback module
3	stands
4	bore
11	mast
12	drill floor
13	rig raising cylinders
14	grabber system
21	fingerboard
22	setback floor
23	setback raising cylinders
24	walking system
25	moving dolly
26	base structure
26a	base element
26b	base element
27	support structure

CLAIMS 1 to 18

1. Drilling rig system, in particular land-based oil-well drilling rig system, comprising:

a rig module adapted to perform drilling operations,

a setback module adapted to hold stands of drill pipe and/or drill collars to be used during the drilling operations,

wherein the setback module is separate from the rig module.

2. System according to claim 1, wherein the setback module is configured for assembling and/or dismantling stands independent from the rig module.

3. System according to claim 1 or 2, wherein, while the setback module is holding the stands, the setback module is adapted to be movable separately from the rig module.

4. System according to any one of the preceding claims, wherein the rig module is adapted to be movable by means of a rig moving means, preferably a rig moving dolly.

5. System according to any one of the preceding claims, wherein the setback module is adapted to be movable by means of a setback moving means, preferably a setback moving dolly.

6. System according to any one of the preceding claims, wherein the rig module comprises rig raising means, preferably rig raising cylinders, configured to raise and lower the rig module.

7. System according to any one of the preceding claims, wherein the setback module comprises setback raising means, preferably setback raising cylinders, configured to raise and lower the setback module.

8. System according to any one of the preceding claims, wherein the rig module and/or the setback module comprises a walking system adapted to move the respective module.

9. System according to any one of the preceding claims, wherein the setback module comprises a grabber system adapted to grab the stands held in the setback module, particularly when the setback module is located adjacent to the rig module.

10. System according to claim 9, wherein the grabber system is adapted to transfer the stands held in the setback module to the rig module when a distance between the rig module and the setback module is between 1 m and 50 m, preferably between 2 m and 40 m, more preferred between 3 m and 30 m, more preferred between 4 m and 20 m, most preferred between 5 m and 10 m.

11. System according to any one of the preceding claims, wherein the setback module is adapted to hold at least 10 stands, preferably at least 50 stands, more preferred at least 100 stands, and most preferred at least 500 stands.

12. System according to any one of the preceding claims, wherein the setback module is adapted to hold stands with at least two joints per stand, preferably at least three joints per stand.

13. System according to any one of the preceding claims, wherein the setback module comprises at least one fingerboard adapted to secure the stands.

14. System according to any one of the preceding claims, wherein the rig module comprises a derrick or drill mast, and a drill floor located under the derrick or drill mast.

15. System according to claim 14, wherein the setback module comprises a setback floor adapted to support the stands, wherein the drill floor is separate from a setback floor.

16. Setback module for use in connection with a rig module in a drilling rig system, comprising:

means for holding stands of drill pipe and/or drill collars to be used during drilling operations,

means for securing the stands,

wherein the setback module is adapted to be movable separately from the rig module.

17. Method for operating a drilling rig system according to any one of claims 1 to 15, comprising:

placing stands of drill pipe and/or drill collars in the setback module,

moving the setback module away from the rig module.

18. Method according to claim 17, further comprising:

relocating the rig module,

moving the setback module towards the relocated rig module,

using the stands held in the setback module during drilling operations.

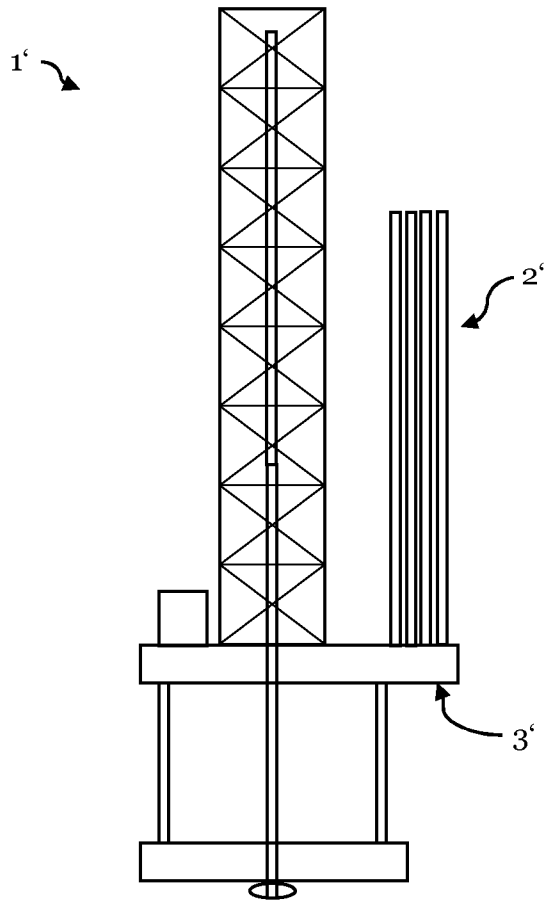


Fig. 1
(prior art)

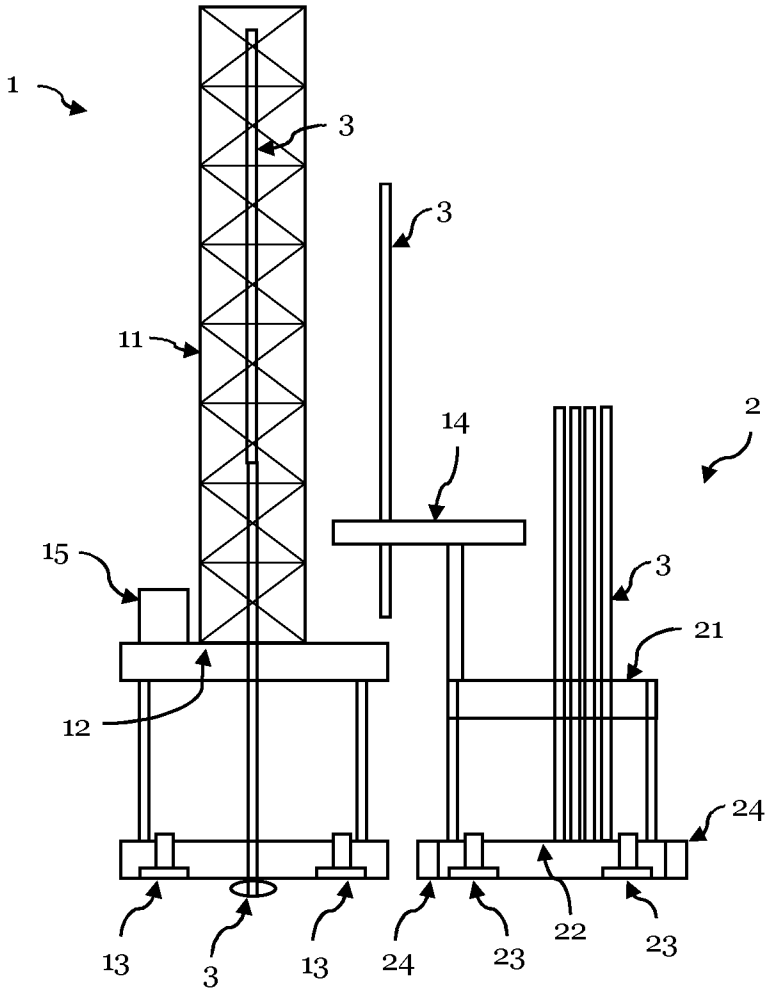


Fig. 2

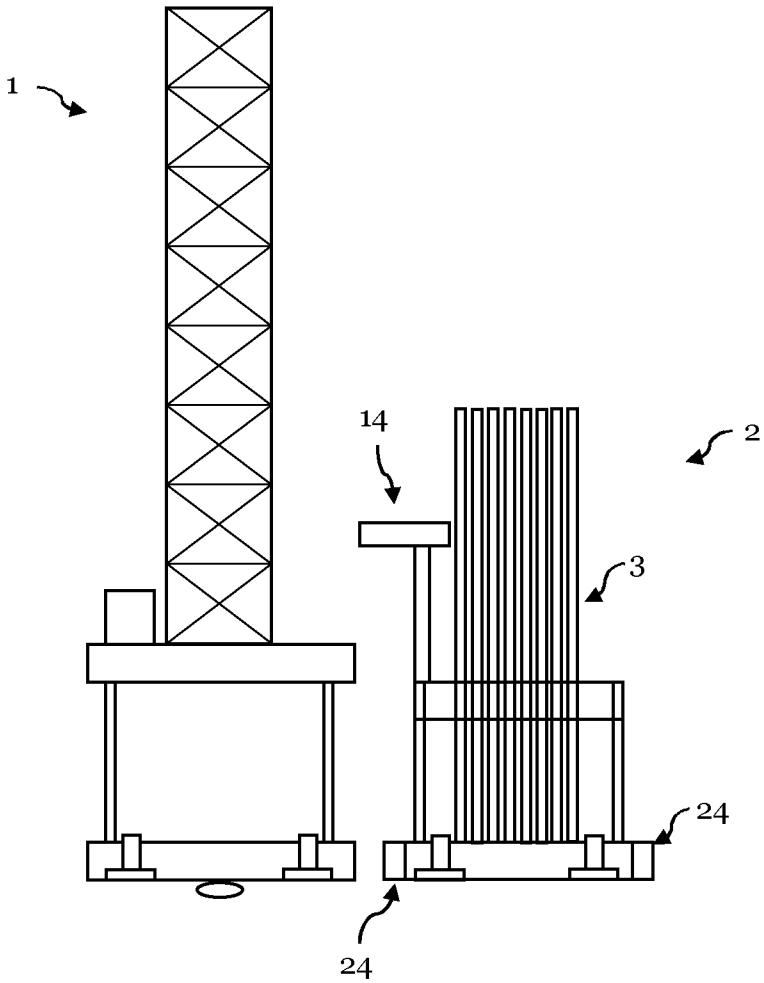


Fig. 3

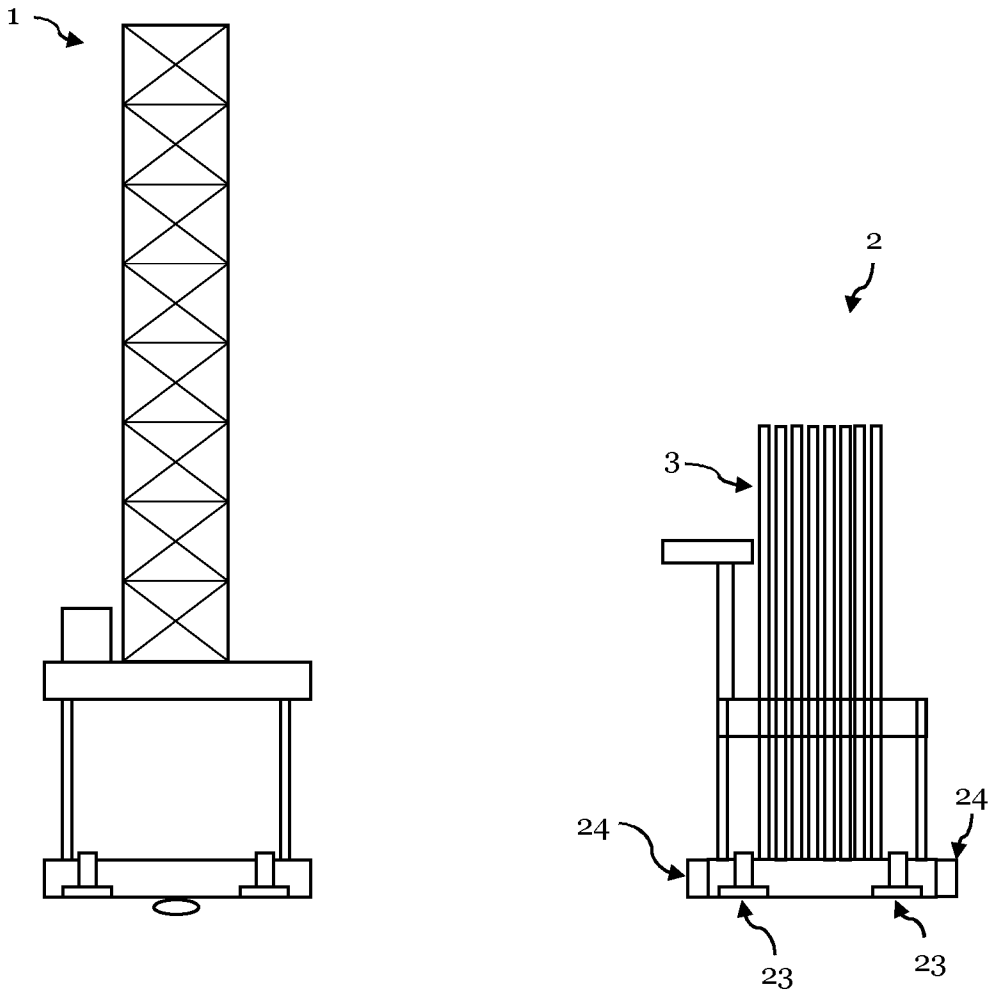


Fig. 4

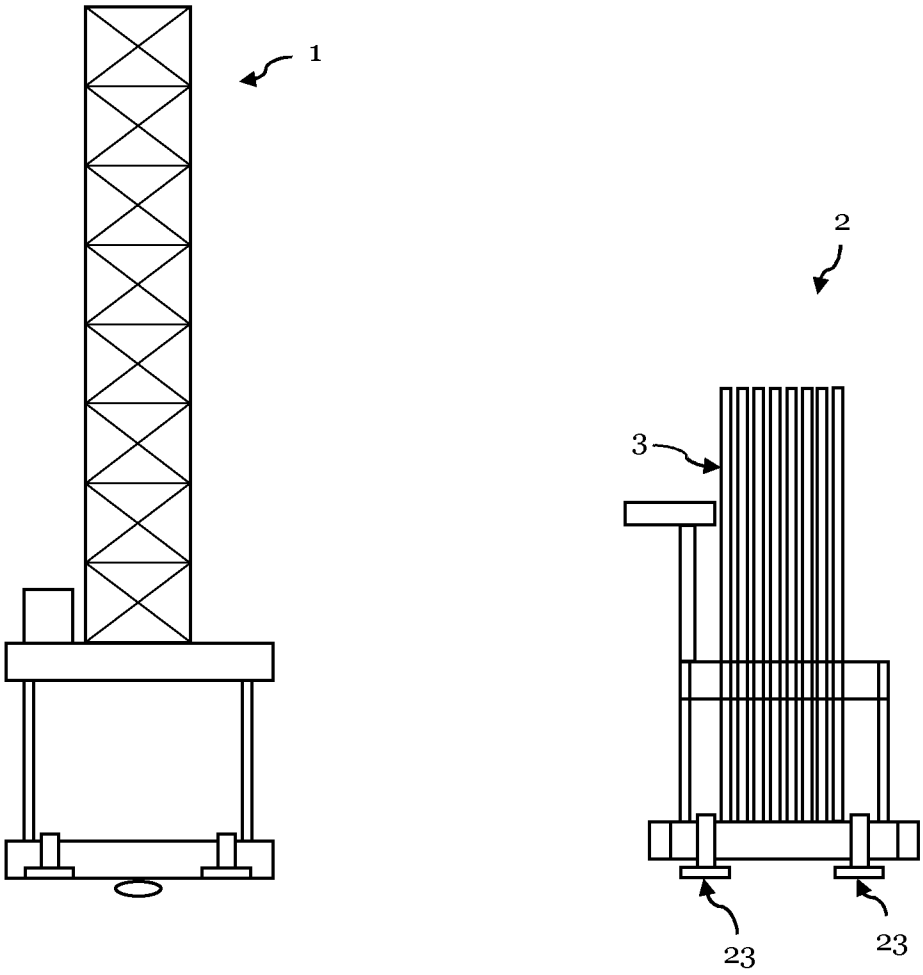


Fig. 5

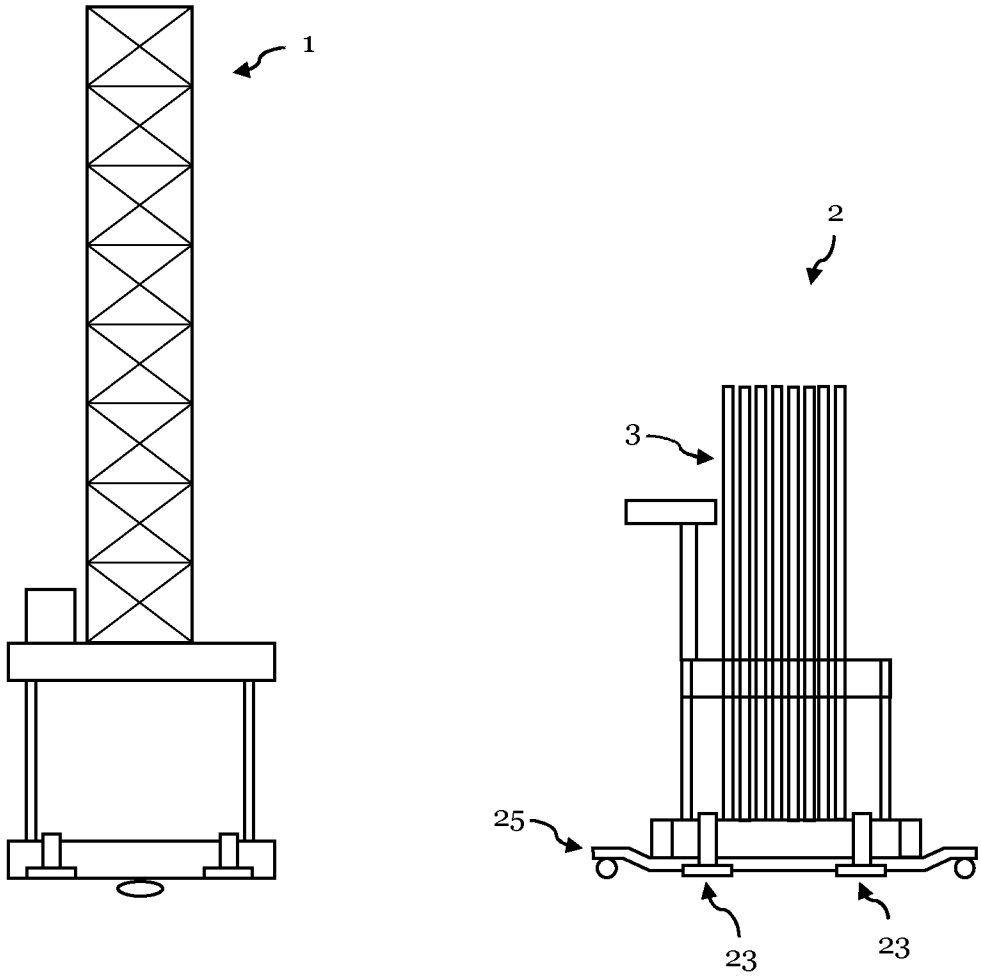


Fig. 6

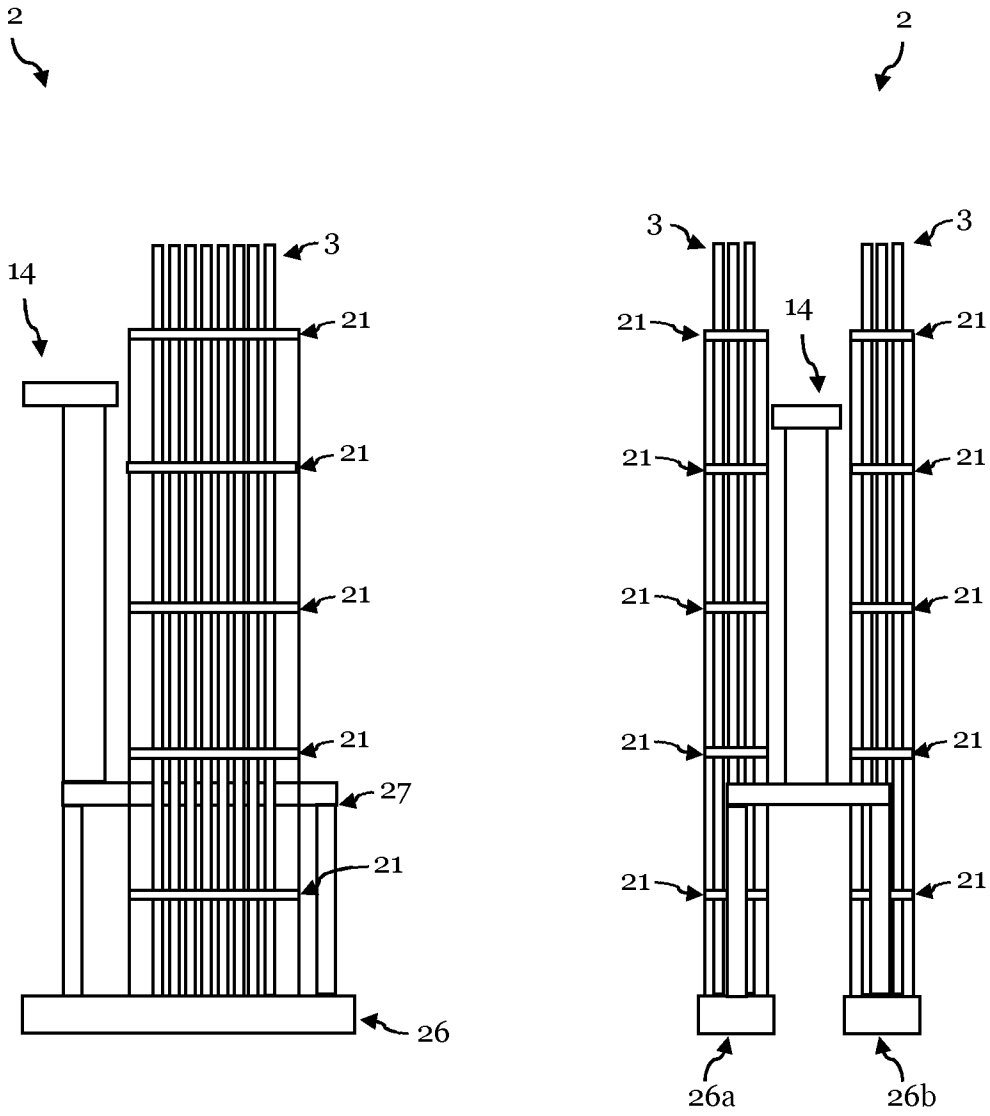


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 2021/060444

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***E21B 19/14*** (2006.01); ***E21B 19/06*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E21B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI, EPODOC, TXTnn

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10344523 A1 (HAAS JOHANN) 21 April 2005 (21.04.2005) entire document	1-18
X	US 2003196791 A1 (DUNN ET AL.) 23 October 2003 (23.10.2003) entire document	1-18
X	WO 2011014074 A1 (SEABED RIG AS ET AL.) 03 February 2011 (03.02.2011) entire document	1-18
X	GB 2346840 A (SOFITECH NV) 23 August 2000 (23.08.2000) entire document	1-18
X	US 4208158 A (DAVIES ET AL.) 17 June 1980 (17.06.1980) entire document	1-18
X	DE 1911968 A1 (AUTOMATIC DRILLING MACH) 16 October 1969 (16.10.1969) entire document	1-18

Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 May 2022 (03.05.2022)	12. May 2022 (12.05.2022)
Name and mailing address of the ISA/AT Austrian Patent Office Dresdner Straße 87, A-1200 Vienna Telephone No. +43 (1) 53424 342	Authorized officer Wagner Sascha Telephone No. +43 1 534 24 381

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 2021/060444

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011120627 A2 (HERRENKNECHT VERTICAL GMBH) 06 October 2011 (06.10.2011) entire document	1-18
E,X	WO 2022008352 A1 (CANRIG ROBOTIC TECHNOLOGIES AS) 13 January 2022 (13.01.2022) entire document	1-18

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB 2021/060444

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