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(54) Title: TENDER ASSISTED DRILLING SYSTEM COMPRISING A HIGH-LINE SYSTEM, METHOD FOR TRANSFERRING TUBULARS USING SUCH A SYSTEM AND METHOD OF INSTALLING SUCH A SYSTEM

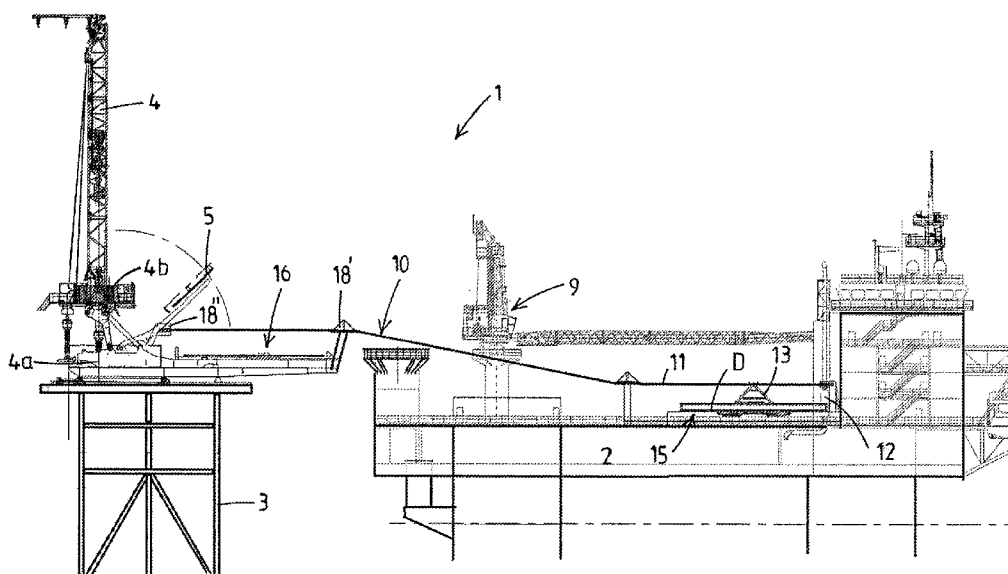


Fig.1

(57) Abstract: The present invention relates to a tender assisted drilling system comprising a high-line system adapted to be placed on a tender vessel and an offshore platform onto which a drilling rig is arranged, which high-line system is adapted to transfer tubulars, in particular double tubular stands, between the tender vessel and the offshore platform. The invention also relates to a method for during a drilling process or during a tripping process transferring double tubular stands between a tender vessel and the offshore platform. The invention also relates to a method of installing such a tender assisted drilling system.



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Title: Tender assisted drilling system comprising a high-line system, method for transferring tubulars using such a system and method of installing such a system

5

Offshore platforms are widely available. Some of them have been used extensively in the past to to extract oil and natural gas at sea. After one or more wells serviced by the platform are depleted or underperforming, the wells may be plugged and the platform may be
10 abandoned meaning that the facilities to drill wells, to extract and process oil and natural gas or to temporarily store product until it can be brought to shore for refining and marketing have been removed.

Hence, what usually remains at sea is an offshore platform with a first and second rig skid
15 beam arranged parallel to each other. However, after some time has passed, newly developed techniques in for instance drilling and well analysis may provide the capability of extracting more product using the platform.

These rig skid beams are suitable to receive a drilling rig, possibly in combination with a pipe
20 loader, typically using a vessel. An advantageous system and method of the same applicant is disclosed in WO2016/144164.

Generally, some of these existing offshore platforms are not able to withstand high loads, e.g. because they are small, aged, or have a low capacity. Hence, although the platforms
25 are suitable to for drilling purposes in that a drilling rig can be provided thereon, the storage of tubulars may be impossible or very limited. This is a drawback for cost-effective use of such a platform.

High-line systems are known in the art, e.g. from US2011/0259640 and WO2008/103156 to
30 transfer tubulars between a tender vessel and an offshore platform.

The known high-line systems are not satisfactory.

It is an object of the invention to provide improved high-line systems and methods wherein
35 use is made of such an improved system.

According to a first aspect, the invention relates to a system according to claim 1 and a method according to claim 11 and 12. The high-line system provides an aerial lift for the tubulars.

- 5 This system and the method of claim 11 has the advantage that the supply of double tubular stands to the drilling rig keeps up with the pace of the drilling rig. In other words, the drilling process of a drilling rig arranged on an offshore platform is no longer slowed down by the lack of tubulars that are available.
- 10 Analogously, this system and the method of claim 12 has the advantage that the removal of double tubular stands from the drilling rig keeps up with the pace of tripping of the drilling rig. In other words, the tripping process of a drilling rig arranged on an offshore platform is no longer slowed down by the removal of tubular stands. Possibly, but not necessarily, the double tubular stands are disconnected into two tubulars at the vessel, followed by placing
- 15 the tubulars in a tubulars storage, e.g. a tubulars bin.

In embodiments, the tender assisted drilling system is capable of transporting 762 metres (2500 foot) of tubulars per hour.

- 20 The tender vessel is advantageously embodied as a floating semi-submersible. However, a floating monohull vessel is also conceivable.

- The tender vessel advantageously comprises a tubular storage, e.g. embodied as a tubulars bin. Possibly, the tubulars bin comprises an elevator mechanism for holding and lifting
- 25 multiple layers of tubulars. An example of such a tubulars bin of the same applicant is disclosed in WO2013/109148. Advantageously, the lifting mechanism has an inclinable lift floor, allowing movement of the tubulars under the influence of gravity.

- It is conceivable that the tender vessel transports pre-fabricated double tubular stands.
- 30 Alternatively, the tender vessel transports single tubulars. In embodiments, the first handling station comprises a bucking unit, adapted to connect two tubulars to each other to form a double tubular stand. Such a bucking unit is well known in the art. Possibly, inclinable rails are provided between the bucking unit and gondola to allow the double tubular stands to move between the bucking unit and the gondola under the influence of gravity.
- 35 Advantageously, an actuator such as a hydraulic cylinder is provided to adjust the inclination of the rails between an inclination towards the bucking unit and an inclination towards the gondola.

Where the tender vessel is a floating vessel, the offshore platform is fixed to the bottom of the sea. Hence, the transfer of double tubular stands according to the invention involves a transfer between a floating and a fixed object, solving the associated problems.

- 5 The first and second handling station comprise equipment to load and/ or unload double tubular stands into and out of a gondola. During drilling, the double tubular stands are loaded into the gondola in the first handling station and unloaded in the second handling station. During tripping, the double tubular stands are loaded into the gondola in the second handling station and unloaded in the first handling station.

10

Advantageously, the double tubular stands are handled in a horizontal orientation. Such equipment e.g. comprises an index finger. More advantageously, the equipment comprises a lifting unit, adapted to receive/ remove double tubular stands under the influence of gravity, and position the double tubular stands into the gondola. Possibly, the equipment comprises
15 a lift floor having an adjustable inclination, allowing gravity-based motion of the double tubular stands between an inclination towards the gondola and away from the gondola. Possibly, an actuator such as a hydraulic cylinder is provided to adjust the inclination.

Between the first and second handling system a cable is provided, e.g. a wire cable, e.g. a
20 metal or synthetic rope or cable. The cable is guide via cable guides, e.g. embodied as sheaves, guide rollers or semi-circular deflection surfaces.

The high-line system further comprises a cable drive, and a gondola being connected to and supported by the cable, defining a first cable section and a second cable section, the first
25 cable section extending via one or more first cable guides to be provided on the tender vessel to the cable drive, and the second cable section extending via one or more platform cable guides to be provided on the platform and one or more second cable guides to be provided on the tender vessel to the cable drive. The gondola is fixed to the cable, e.g. via a detachable or a fixed grip.

30

The cable drive should be able to drive the cable in two directions: towards the platform and away from the platform towards the tender vessel, as the gondola moves between the first and second handling station in a to-and-fro movement.

- 35 The cable drive to drive the cable is e.g. embodied as a winch and a drum. Alternatively, a bull wheel connected to an engine or motor is provided. In embodiments, the cable drive comprises a first drum and a second drum, wherein the first cable section is connected to

the first drum and the second cable section is connected to the second drum, which first and second drum are adapted to unspool respectively wind a cable portion and vice versa. Possibly, a clutch is provided between the first and second drum, and wherein a single motor is provided for driving the first and second drum. Alternatively, separate motors are
5 provided.

The fixed offshore platform is preferably provided with a first and second rig skid beam arranged parallel to each other. A drilling rig, possibly in combination with a pipe loader, is preferably received by such skid beams. Alternatively, the rig, and possibly the pipe loader,
10 are directly mounted to the platform. Possibly one or more of the following elements are positioned onto the offshore platform in one or more hoisting operations, e.g. from the tender vessel: a skid system, mud treatment equipment, drill cabin, drill floor elements, a base, pipe loader, pipe racks, drilling rig mast sections, possibly comprising a rig service crane at a top section thereof, draw works, a top drive, a blow-out preventer.

15 The drilling rig is suitable to perform drilling operations in a well in a firing line of the rig. Possibly, the drilling rig is provided movable on the platform.

Advantageously, the high-line system is adapted to allow movement, e.g. skidding of the
20 drilling rig between multiple wells, by paying out or hauling in the second cable section, whichever is required. The above-described embodiment comprising a first and second drum is suitable for such an operation.

In embodiments, the second cable section between the tender vessel and the platform
25 opposite the location of the gondola is at least 0,5 meters horizontally spaced from the gondola. This prevents undesired contact or even entanglement of the cable portions.

In embodiments, the high-line system is motion compensated by a motion compensator system. Advantageously, the motion compensator system comprises a first motion
30 compensator attached to the first cable section and a second motion compensator attached to the second cable section.

The gondola is adapted to be filled with multiple double tubular stands, preferably in a horizontal orientation. Possibly, the gondola comprises rails, extending transverse to the
35 longitudinal direction of the double tubular stands to be loaded thereon.

Possibly, the gondola is adapted to transfer double tubular stands, tubulars or parts thereof or pieces of tubing string in a leaktight bin. This is advantageous e.g. during plug and abandonment (P&A) procedures, where the production tubing string is pulled out of the well and plugs are provided to seal the well permanently. This process is e.g. disclosed in

5 WO2016/178561 of the same applicant. During this process, the tubing string is not unscrewed such as in a tripping process, but simply cut into pieces. The gondola of the present invention is also suitable to handle such pieces of tubing string. It is advantageous to provide a leaktight bin to transfer soiled tubulars or parts thereof, as in particular these cut-off pieces of tubing string are soiled.

10

Advantageously, the system further comprises a control unit for controlling the bucking unit and cable drive to fully automatically transfer the tubulars. Such automated control and gravity based moving systems dispense the need of manual interference, and hence make the transfer operation more safe.

15

In embodiments, the first handling station further comprises a double tubular stand storage opposite the bucking unit, and wherein the gondola comprises both a lateral left-hand opening and a lateral right-hand opening allowing the loading and/ or unloading of double tubular stands both from the bucking unit and from the double tubular stand storage.

20 Advantageously, the double tubular stand storage comprises a surface having an adjustable inclination allowing gravity-based motion of the double tubular stands between an inclination towards the first handling station and away from the first handling station.

Such a double tubular stand storage allows the continuous assembly of double tubular
25 stands by the bucking unit, also when the gondola has left the first handling station.

Advantageously, the lifting unit of the first handling station allows the passage of double tubular stands from the bucking unit to the double tubular stand storage under the influence of gravity.

30

In embodiments, a pipe loader adapted to handle double tubular stands is provided on the platform, adapted to grip double tubular stands in a substantially horizontal position from the second handling station and move the double tubular stands between the substantially horizontal position to an upward angled substantially vertical position, e.g. in the firing line of
35 the drilling rig or in a vertical pipe rack. Such a pipe loader is well known in the art. An exemplary pipe loader of the same applicant is described in WO2014/133389.

In embodiments, the second handling station further comprising an intermediate platform storage for the storage of double tubular stands. Possibly, the intermediate platform storage is provided adjacent the pipe loader opposite the equipment to load and/ or unload double tubular stands into and out of a gondola. Alternatively or in addition thereto, an intermediate
5 platform storage could also be provided adjacent the equipment to load and/ or unload double tubular stands into and out of a gondola.

Such a platform storage is advantageous to buffer relatively small amounts of double tubular stands and allow a continuous operation of the pipe loader.

10

In embodiments, the second handling station further comprises equipment such as an index system to load and/ or unload double tubular stands onto and away from the pipe loader.

The object of the invention is also achieved by a second aspect of the invention according to
15 the system of claim 14 and the method of claim 19. In particular, the second aspect relates to a modular high-line system adapted to be placed on a tender vessel and an offshore platform, which high-line system is adapted to transfer items such as tubulars between the tender vessel and the offshore platform, the modular high-line system comprising:

- a first handling station adapted to be placed on the tender vessel, comprising
20 equipment to load and/ or unload the items into and out of a gondola;
- a second handling station adapted to be placed on the platform, comprising equipment to load and/ or unload the items into and out of a gondola;
- a cable extending between the first and second handling station,
- a gondola adapted to be filled with multiple items, which is movable between the first
25 handling station and the second handling station, the gondola being connected to and supported by the cable, defining a first cable section and a second cable section,
 - o the first cable section extending via the one or more first cable guides to a cable drive;
 - 30 o the second cable section extending via one or more platform cable guides and one or more second cable guides to the cable drive;
- a platform module with
 - o the second handling station;
 - o the one or more platform cable guides and the second cable section guided
35 thereby;
- a vessel module with
 - o the first handling station;

- the cable drive;
 - the one or more first cable guides and the first cable section guided thereby;
 - the one or more second cable guides and a second cable section guided thereby.
- 5 The second aspect of the invention also relates to a method of installing modular high-line system as described above, comprising the steps of:
- a. transferring the platform module onto the platform, e.g. with the aid of a crane;
 - b. mounting the platform module onto the platform.
- 10 Such a modular high-line system allows easy installation and disassembly of the high-line system, for a variety of purposes, i.e. not limited to drilling.

Preferably, the tender vessel is equipped with the modular high-line system and allowed to sail towards the offshore platform, where the platform module is transferred onto the

15 platform, e.g. with the aid of a crane, preferably also provided on the tender vessel. It is also conceivable that a third vessel sails towards the offshore platform and the tender vessel to install both the platform module and the vessel module.

Possibly, a drilling rig is positioned on the offshore platform prior to the mounting installation

20 of the platform module onto the platform. Possibly, also a pipe loader was already provided at the offshore platform prior thereto.

In embodiments, the platform module is formed integral with a drilling rig, allowing the drilling rig and the platform module to be installed onto the offshore platform as a unit.

25

It is also conceivable that a pipe loader adapted to grip tubulars in a substantially horizontal position and move the tubulars between the second handling station and an upward angled substantially vertical position, e.g. in the firing line of the drilling rig or in a vertical pipe rack, is formed integral with the platform module, allowing the pipe loader and the platform

30 module to be installed onto the offshore platform as a unit.

In embodiments, the first handling station comprises a bucking unit adapted to connect two tubulars to each other to form a double tubular stand and wherein the gondola, the first and the second handling station are adapted to handle double tubular stands.

35

The invention also relates to a tender assisted drilling system comprising a modular high-line system adapted to be placed on a tender vessel and an offshore platform onto which a

drilling rig is arranged, which high-line system is adapted to transfer tubulars between the tender vessel and the offshore platform, the modular high-line system comprising:

- a first handling station adapted to be placed on the tender vessel, comprising equipment to load and/ or unload double tubular stands into and out of a gondola;
- 5 - a second handling station adapted to be placed on the platform, comprising equipment to load and/ or unload double tubular stands into and out of a gondola;
- a cable extending between the first and second handling station,
- a gondola adapted to be filled with multiple tubulars, which is movable between the first handling station and the second handling station, the gondola being connected
- 10 to and supported by the cable, defining a first cable section and a second cable section,
 - o the first cable section extending via the one or more first cable guides to a cable drive;
 - o the second cable section extending via one or more platform cable guides
 - 15 and one or more second cable guides to the cable drive;
- a platform module with
 - o the second handling station;
 - o the one or more platform cable guides and a second cable section guided thereby;
- 20 - a vessel module with
 - o the first handling station;
 - o the cable drive;
 - o the one or more first cable guides and a first cable section guided thereby;
 - o the one or more second cable guides and a second cable section guided
 - 25 thereby.

Optional features of the first aspect of the invention can also be combined with the other aspects of the invention. The aspects of the invention will be explained further in relation to the attached drawings, in which:

30 Fig. 1 represents a side view of a tender assisted drilling system according to both aspects of the invention;

Fig. 2 represents a top view of the tender assisted drilling system of fig. 1;

Fig. 3 represents a detail of the platform in side view of fig. 1;

Fig. 4 represents a detail of the platform in top view of fig. 2;

35 Fig. 5 represents a detail of the vessel in top view of fig. 2;

Fig. 6 represents a detail of the vessel in side view of fig. 1;

Fig. 7 represents a top view of the tender assisted drilling system of fig. 1, not yet installed onto the offshore platform;

Figs. 8a-8d are detailed side views of the first handling station in various positions;

Figs. 9a-9b are detailed side views of the second handling station in various positions;

- 5 Fig. 10 is a schematic overview of the high-line system of the system of the preceding drawings.

In figures 1-10, a tender assisted drilling system 1 according to both aspects of the invention is shown.

10

The tender assisted drilling system 1 comprises a high-line system 10, which is adapted to be placed on a tender vessel 2 and an offshore platform 3 onto which a drilling rig 4 is arranged. Drilling rig 4 is adapted to perform drilling operations in a firing line 4a. The drilling rig 4 as shown is equipped with a drill cabin 4b.

15

In figs. 1-6 the high-line system 10 of the invention is already installed onto the tender vessel 2 and offshore platform 3, while in fig. 7 it is still provided on the tender vessel 2. The tender vessel 2 is here embodied as a semi-submersible, floating vessel.

- 20 The tender vessel 2 is provided with a crane 9, adapted to install the platform module onto the platform, and preferably also the drilling rig 4 and pipe loader 5. In the top view of fig. 2, a bridge 8 is provided enabling access of the platform 3 for people and cargo.

- 25 The high-line system 10 is adapted to transfer tubulars T between the tender vessel 2 and the offshore platform 3. According to the first aspect of the invention, the high-line system 10 is adapted to, during a drilling process, transfer double tubular stands D between the tender vessel 2 and the offshore platform 3.

- 30 The high-line system 10 comprises a cable 11, a cable drive 12 adapted to be provided on the tender vessel, and a gondola 13 adapted to be filled with tubulars, which is connected to and supported by the cable 11, defining a first cable section 11a and a second cable section 11b.

- 35 The high-line system 10 further comprises a first handling station 15 adapted to be placed (as shown in the drawings) on the tender vessel, comprising equipment 15a to load and/ or unload tubulars and/ or double tubular stands into and out of a gondola, and further a second handling station 16 adapted to be placed (as shown in the drawings) on the

platform, comprising equipment 16a to load and/ or unload tubulars and/ or double tubular stands into and out of a gondola.

5 The gondola 13 is movable between the first handling station 15 and the second handling station 16 in a to-and-fro motion.

The cable 11 extends between this first and second handling station, such that the first cable section 11a thereof extends from the gondola 13 via one or more first cable guides 17 provided on the tender vessel to the cable drive 12, and such that the second cable section 10 11b thereof extends via one or more platform cable guides 18 provided on the platform and one or more second cable guides 19 provided on the tender vessel to the cable drive. In fig. 1-4, two cable guides 18' and 18'' are visible. In figs. 5 and 6 first cable guides 17' and 17'' are visible, and second cable guides 19' and 19''. Here, the guides 17' and 19'' are provided on a single drum.

15

As visible in the top views of fig. 2, 4 and 5, the first and second cable sections 11a, 11b are horizontally spaced apart, in particular between the tender vessel 2 and the offshore platform 3. This prevents contact between the cable sections and increases safety of the system.

20

The offshore platform as shown in fig. 7 initially comprised nothing but a pair of skid beams 3a, 3b, onto which, as visible in fig. 3, are positioned multiple components including a drilling rig 4 and a pipe loader 5. In fig. 3, a base component B comprising second handling station 16 and platform cable guides 18' and 18'' is mounted thereon. In fig. 7, it is visible that this 25 base component B is still on the tender vessel 2, yet to be transferred to the platform by a crane 9. According to the second aspect of the invention, at least the second handling station and the platform cable guides are mounted as a platform module, possibly positioned onto base component B, onto the platform.

30 In fig. 7 also a vessel module V according to the second aspect of the invention is visible, comprising the first handling station 15, cable drive 12, first cable guides 17 and second cable guides 19. Here, the vessel module V also comprises bucking unit 20 adapted to connect two tubulars to each other to form a double tubular stand. Also tubular bins 40 for the storage of tubulars are here part of the vessel module V.

35

In fig. 7 it is visible that prior to the mounting of the platform module onto the platform, the cable 11 is already reeved between the cable guides 17; 19 of the vessel module and the

cable guides 18 mounted onto the platform module. This is highly advantageous in view of efficiency.

In figs. 8a-8d, the first handling station 15 is shown in detail and in different positions. Here, the equipment to load and/ or unload tubulars and/ or double tubular stands into and out of a gondola comprises a lifting unit 15a, adapted to receive/ remove tubulars and/ or double tubular stands under the influence of gravity, and position the double tubular stands into the gondola. The lifting unit 15a comprises a lift floor 15b having an adjustable inclination, allowing gravity-based motion of the tubulars and/ or double tubular stands between an inclination towards the gondola and away from the gondola. Possibly, an actuator such as a hydraulic cylinder is provided to adjust the inclination.

In the shown embodiment, the first handling station is provided adjacent a tubulars bin 40 provided on the vessel. Here, the tubulars bin comprises single tubulars T. The tubulars bin is equipped with an elevator mechanism 41 for holding and lifting multiple layers of tubulars. The elevator mechanism 41 comprises an inclinable elevator floor 41a, allowing movement of the tubulars under the influence of gravity.

The first handling station as shown comprises a bucking unit 20, adapted to connect two tubulars T to each other to form a double tubular stand D. Such bucking units are commonly known in the art.

Furthermore, the first handling station as shown comprises two double tubular stand storages 21, 25 at opposed sides of the equipment 15a. Tubular stand storage 21 is provided adjacent the bucking unit 20 and is adapted to store tubular stands prepared by the bucking unit 20, e.g. in absence of the gondola 13. The tubular stand storages 21, 25, both comprise an inclinable surface 21a, 25a respectively, e.g. comprising parallel rails, the inclination of which is adaptable by actuators 21b, 25b, such as hydraulic cylinders, respectively.

By adapting the inclination, the tubular stand storage is able to move the double tubular stands under the influence of gravity to and from the bucking unit and to and from the gondola.

Advantageously, the gondola 13 comprises both a lateral left-hand opening 13a and a lateral right-hand opening 13b allowing the loading and/or unloading of double tubular

stands both from the bucking unit 20, here via tubular stand storage 21, and from the double tubular stand storage 25.

It is also conceivable that the tubular stand storages 20, 25 are able to store single tubulars or parts of tubulars or pieces of tubular string.

5 In fig. 8a, the process of unloading tubulars T from the storage bin 40 is shown, by inclining the elevator floor 41a towards the bucking unit 20. At the bucking unit, the tubulars T are coupled to form double tubular stands D. The inclinable surface 21a of tubular stand storage 21 is inclined towards the equipment 15a, allowing the double tubular stands D to roll onto
10 the lift floor 15b, and here into the gondola 13 via left-hand opening 13a.

In fig. 8b, the process of unloading double tubular stands D from the gondola 13 is shown. Lift floor 15 b is now inclined towards the bucking unit, allowing tubular stands D to roll out of the gondola via opening 13a and over the inclined surface 21a of the tubular stand storage
15 21 into the bucking unit 20. The bucking unit 20 decouples the tubular stand D into two tubulars which can be stored into the bin 40. By adjusting the inclination of the surface 21a of the tubular stand storage, the supply of tubulars towards the bucking unit can be controlled.

20 In fig. 8c, the process of unloading double tubular stands D from the gondola via right-hand opening 13b to the double tubular stand storage 25 is shown. This is for example advantageous when the double tubular stand storage 21 is full, and/ or the bucking unit 20 is still uncoupling double tubular stands. Also when an excess amount of double tubular stands is made by the bucking unit 20, waiting to be transferred to the platform by the
25 gondola, the tubular stand storage 25 can be used to store this excess amount of double tubular stands. Now, the lift floor 15b is inclined towards the tubular stand storage 25, and the inclinable surface 25a of the tubular stand storage 25 is inclined away from the lifting device 15a.

30 In fig. 8c the gondola 13 is shown on the lifting unit 15a. However, it is also possible that the gondola is not there but at the platform. The lift floor 15b may still be inclined and capable to allow the transfer of double tubular stands from the double tubular stand storage 21 to the tubular stand storage 25.

35 In fig. 8d, the excess amount of double tubular stands stored in the double tubular stand storage 25 is rolled back into the gondola 13 via right-hand opening 13b.

In figs. 9a and 9b the second handling station 16 is shown in further detail in distinct positions. The equipment 16a to load and/ or unload double tubular stands into and out of a gondola 13 is here also embodied as a lifting unit 16a comprising an inclinable lift floor 16b, similar to the equipment of the first handling station 15. The inclinable lift floor 16b allows
5 movement of the double tubular stands towards and away from the second handling station and the gondola under the influence of gravity.

The second handling station 16 is provided on the platform 3, adjacent pipe loader 5, which is adapted to grip double tubular stands in a substantially horizontal position and move the
10 double tubular stands between the second handling station and an upward angled substantially vertical position, e.g. in the firing line of the drilling rig.

In the shown embodiment, the second handling station 16 comprises an intermediate platform storage 30 and an intermediate platform storage 36 for the storage of double
15 tubular stands at opposed sides of the pipe loader 5.

Both intermediate platform storages 30, 36 comprise an inclinable surface 30a, 36a respectively, e.g. comprising parallel rails, the inclination of which is adaptable by actuators 30b, 36b, such as hydraulic cylinders, respectively.

20

By adapting the inclination, the intermediate platform storages 30, 36 are able to move the double tubular stands D under the influence of gravity to and from the pipe loader 5 and to and from the gondola 13.

25 In the shown embodiment, the second handling station 16 further comprising equipment to load and/ or unload double tubular stands onto and away from the pipe loader. Here, at both sides of the pipe loader 5 an index system 32, 38 is provided to load/ unload tubulars and/ or tubular stands from the intermediate platform storage 30 and 36 respectively.

30 It is also conceivable that the tubular stand storages 30, 36 are able to store single tubulars or parts of tubulars or pieces of tubular string.

In fig. 9a, the loading of double tubular stands D from the pipe loader 5 into the gondola 13 is shown. This e.g. takes place during tripping. The surface 30a of the intermediate platform
35 storage 30 is inclined towards the gondola 13, and the lift floor 16b is inclined to be in line therewith.

In fig. 9b, the gondola 13 loaded with multiple double tubular stands D has possibly just arrived at the platform 3. The lifting unit 16a is to be operated to lift the lift floor 16b and the tubular stands D, to be subsequently inclined towards and in line with the intermediate platform storage 30 and pipe loader 5 to allow the double tubular stands D to roll, under the
5 influence of gravity, from the gondola via opening 13a over the platform storage 30 onto pipe loader 5.

In fig. 10, a schematic overview of the high-line system 10 and in particular the cable 11 is presented. The gondola 13 defines a first cable section 11a and a second cable section
10 11b. The first cable section 11a extending via multiple first cable guides 17', 17'' and 17''', schematically shown, provided on the tender vessel 2 to the cable drive 12. The second cable section 11b extends via multiple, here two, platform cable guides 18 provided on the platform 3 and multiple second cable guides 19', 19'' and 19''' provided on the tender vessel 2 to the cable drive 12.

15

The cable drive 12 of the shown embodiment, as also visible in fig. 5, comprises a first drum 12a and a second drum 12b, wherein the first cable section 11a is connected to the first drum and the second cable section 11b is connected to the second drum, which first and second drum are adapted to unspool respectively wind a cable portion and vice versa.
20 Between the first and second drum 12a, 12b, a clutch 12c is provided. Here, the drums 12a, 12b are driven by a single motor 12d.

The high-line system 10 is motion compensated by a motion compensator system comprising a first motion compensator 28 attached to the first cable section 11a and a
25 second motion compensator 29 attached to the second cable section 11b.

CLAIMS

1. Tender assisted drilling system (1) comprising a high-line system (10) adapted to be placed on a tender vessel (2) and an offshore platform (3) onto which a drilling rig (4) is arranged, which high-line system is adapted to, during a drilling process, transfer double tubular stands (D) between the tender vessel and the offshore platform, the high-line system
- 5 comprising:
- a first handling station (15) adapted to be placed on the tender vessel, comprising equipment (15a) to load and/ or unload double tubular stands into and out of a gondola;
 - a second handling station (16) adapted to be placed on the platform, comprising
 - 10 equipment (16a) to load and/ or unload double tubular stands into and out of a gondola;
 - a cable (11) extending between the first and second handling station,
 - a cable drive (12) adapted to be provided on the tender vessel,
 - a gondola (13) adapted to be filled with multiple double tubular stands, which is
 - 15 movable between the first handling station (15) and the second handling station (16), the gondola being connected to and supported by the cable, defining a first cable section (11a) and a second cable section (11b),
 - o the first cable section (11a) extending via one or more first cable guides (17) to be provided on the tender vessel to the cable drive (12);
 - 20 o the second cable section (11b) extending via one or more platform cable guides (18) to be provided on the platform and one or more second cable guides (19) to be provided on the tender vessel to the cable drive.
2. System according to claim 1, the first handling station comprising a bucking unit (20),
- 25 adapted to connect two tubulars (T) to each other to form a double tubular stand (D).
3. System according to claim 2, the first handling station further comprising a double tubular stand storage (25) opposite the bucking unit (20), and wherein the gondola (13) comprises both a lateral left-hand opening (13a) and a lateral right-hand opening (13b)
- 30 allowing the loading and/or unloading of double tubular stands both from the bucking unit (20) and from the double tubular stand storage (25).
4. System according to one or more of the preceding claims, further comprising a pipe loader (5) on the platform, adapted to grip double tubular stands in a substantially horizontal

position and move the double tubular stands between the second handling station and an upward angled substantially vertical position.

5. System according to one or more of the preceding claims, the second handling

5 station further comprising an intermediate platform storage (36) for the storage of double tubular stands.

6. System according to claim 4 or 5, the second handling station (16) further comprising equipment such as an index system (32) to load and/ or unload double tubular stands onto

10 and away from the pipe loader.

7. System according to any of the preceding claims, further comprising a tubulars bin (40) provided on the vessel, the tubulars bin comprising an elevator mechanism (41) for holding and lifting multiple layers of tubulars.

15

8. System according to any of the preceding claims, the cable drive (12) comprising a first drum (12a) and a second drum (12b), wherein the first cable section (12a) is connected to the first drum and the second cable section (11b) is connected to the second drum, which first and second drum are adapted to unspool respectively wind a cable portion and vice

20 versa.

9. System according to any of the preceding claims, wherein the high-line system is motion compensated by a motion compensator system comprising a first motion compensator (28) attached to the first cable section (11a) and a second motion

25 compensator (29) attached to the second cable section (11b).

10. System according to any of the preceding claims 2-9, further comprising a control unit for controlling the bucking unit and cable drive to fully automatically transfer the tubulars.

30

11. Method for during a drilling process transferring tubulars from a tender vessel to a drilling rig arranged on an offshore platform wherein use is made of a system comprising a high-line system according to one or more of the preceding claims, the method comprising, during said drilling process, the following steps:

35 a) on the vessel, removing two tubulars from a tubulars storage, e.g. a tubulars bin;

b) connecting the two tubulars to each other to form a double tubular stand;

- c) loading multiple double tubular stands in the gondola at said first handling station, to obtain a gondola loaded with multiple double tubular stands;
- d) transferring the gondola loaded with the multiple double tubular stands with the high-line system to the platform;
- 5 e) on the platform, unloading the double tubular stands from the gondola at the second handling station.

12. Method for during a tripping process transferring tubulars from a drilling rig arranged on an offshore platform to a tender vessel wherein use is made of a system comprising a
10 high-line system according to one or more of the preceding claims, the method comprising, during said tripping process, the following steps:

- a. on the platform, loading multiple double tubular stands into the gondola at the second handling station;
- 15 b. transferring the gondola loaded with the multiple double tubular stands with the high-line system to the tender vessel;
- c. on the vessel, unloading the multiple double tubular stands from the gondola at said first handling station.

20 13. Method of claim 12, followed by:

- d. disconnecting the double tubular stand into two tubulars;
- e. placing the tubulars in a tubulars storage, e.g. a tubulars bin.

14. Modular high-line system (10) adapted to be placed on a tender vessel (2) and an
25 offshore platform (3), which high-line system is adapted to transfer items such as tubulars between the tender vessel and the offshore platform, the modular high-line system comprising:

- a first handling station (15) adapted to be placed on the tender vessel, comprising equipment to load and/ or unload the items into and out of a gondola;
- 30 - a second handling station (16) adapted to be placed on the platform, comprising equipment to load and/ or unload the items into and out of a gondola;
- a cable (11) extending between the first and second handling station,
- a gondola (13) adapted to be filled with multiple items, which is movable between the first handling station (15) and the second handling station (16), the gondola being
35 connected to and supported by the cable, defining a first cable section (11a) and a second cable section (11b),

- the first cable section extending via the one or more first cable guides (17) to a cable drive (12);
 - the second cable section extending via one or more platform cable guides (18) and one or more second cable guides (19) to the cable drive;
- 5 - a platform module with
 - the second handling station (16);
 - the one or more platform cable guides (18) and the second cable section guided thereby;
- a vessel module with
 - 10 ○ the first handling station (15);
 - the cable drive (12);
 - the one or more first cable guides (17) and the first cable section guided thereby;
 - the one or more second cable guides (19) and a second cable section guided
 - 15 thereby.

15. System according to the preceding claim 14, wherein the platform module is formed integral with a drilling rig, allowing the drilling rig and the platform module to be installed onto the offshore platform as a unit.

20

16. System according to the claims 14 or 15, wherein a pipe loader (5) adapted to grip tubulars in a substantially horizontal position and move the tubulars between the second handling station and an upward angled substantially vertical position is formed integral with the platform module, allowing the pipe loader and the platform module to be installed onto

25 the offshore platform as a unit.

17. System according to claim 14, wherein the first handling station comprises a bucking unit adapted to connect two tubulars to each other to form a double tubular stand and wherein the gondola, the first and the second handling station are adapted to handle double

30 tubular stands.

18. System according to one or more of the preceding claims, further comprising a crane for transferring the platform module onto the offshore platform.

35 19. Method of installing a modular high-line system according to one or more of the preceding claims 14-18, comprising the steps of:

a. transferring the platform module onto the platform, e.g. with the aid of a crane;

b. mounting the platform module onto the platform.

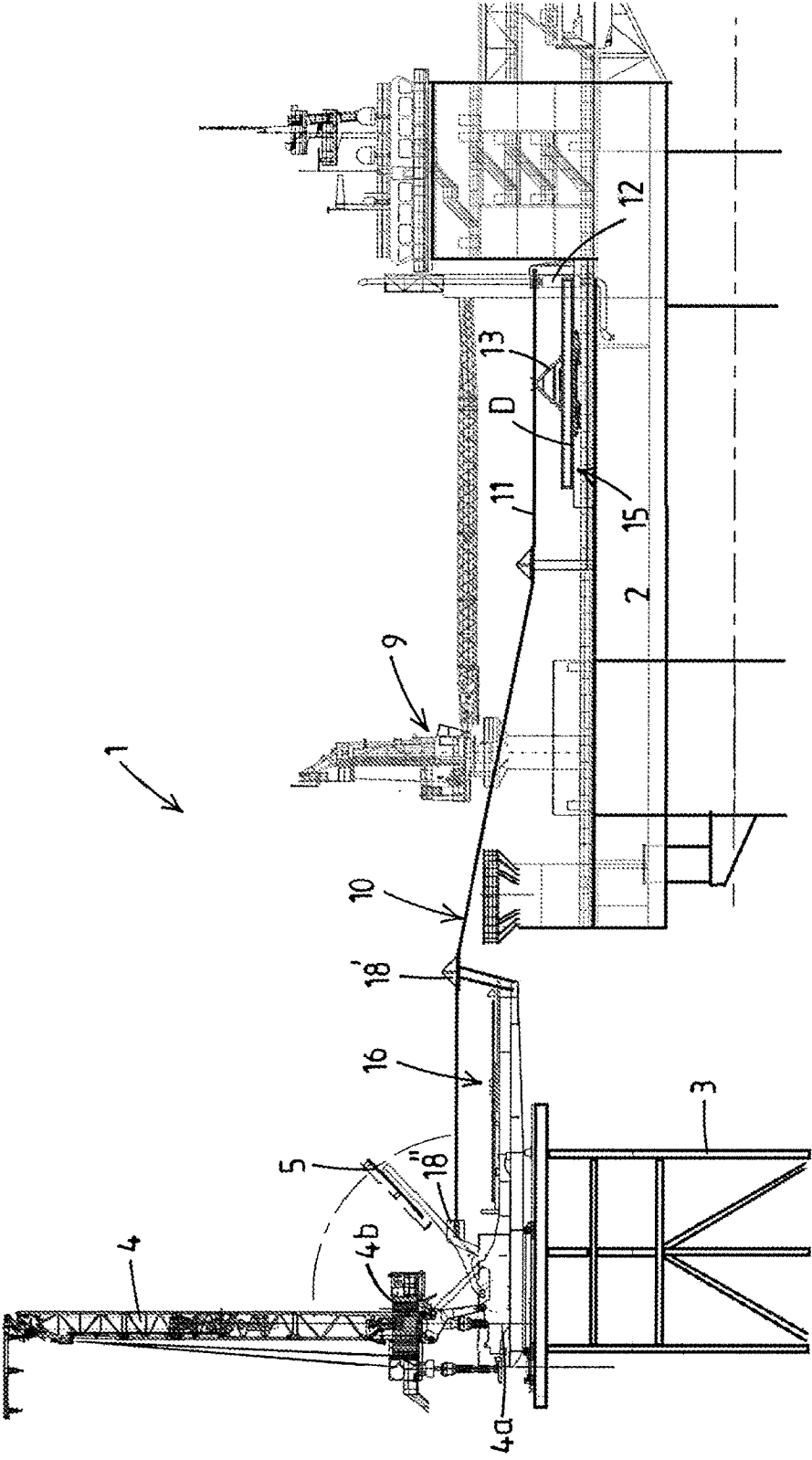


Fig.1

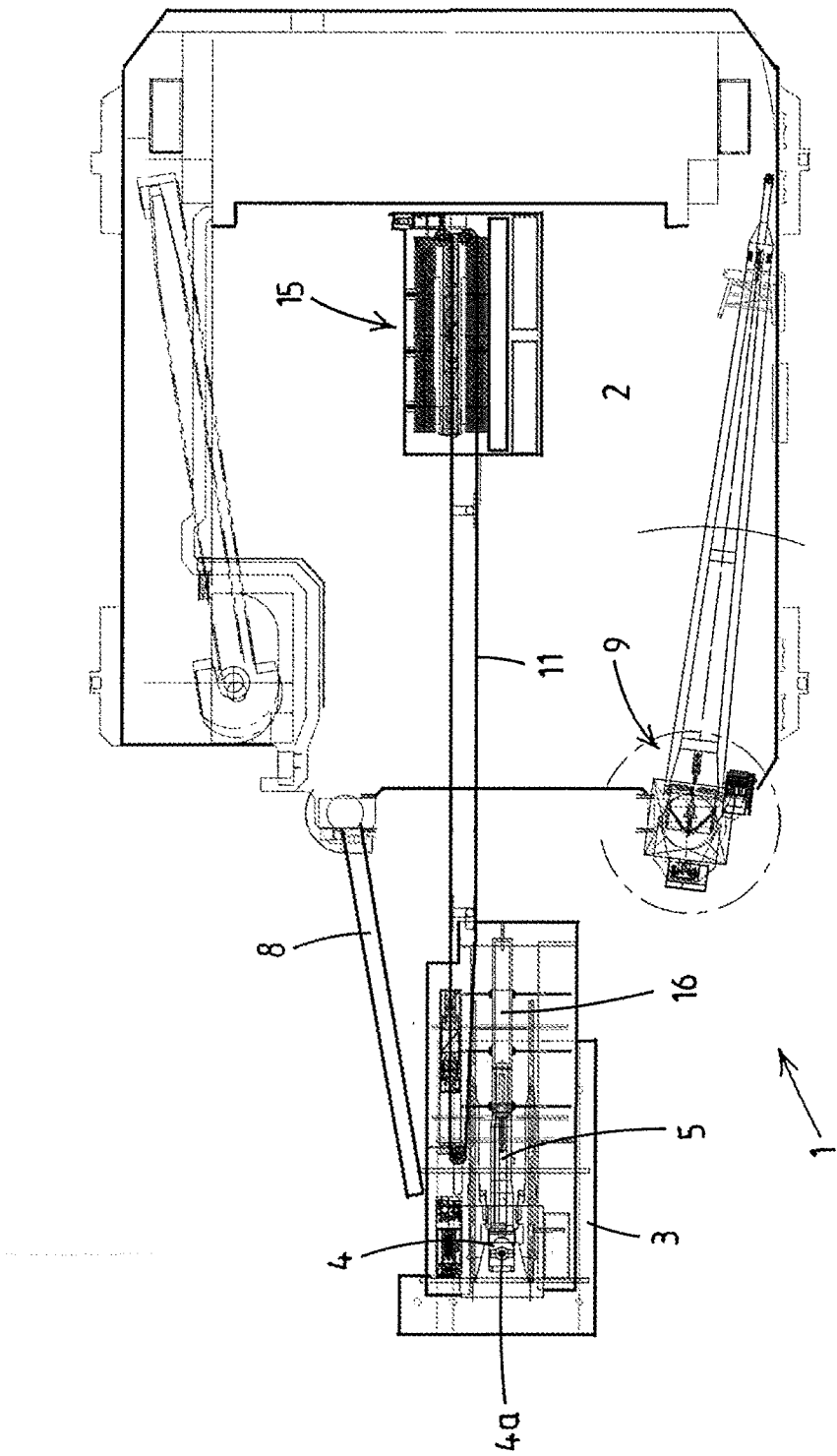


Fig.2

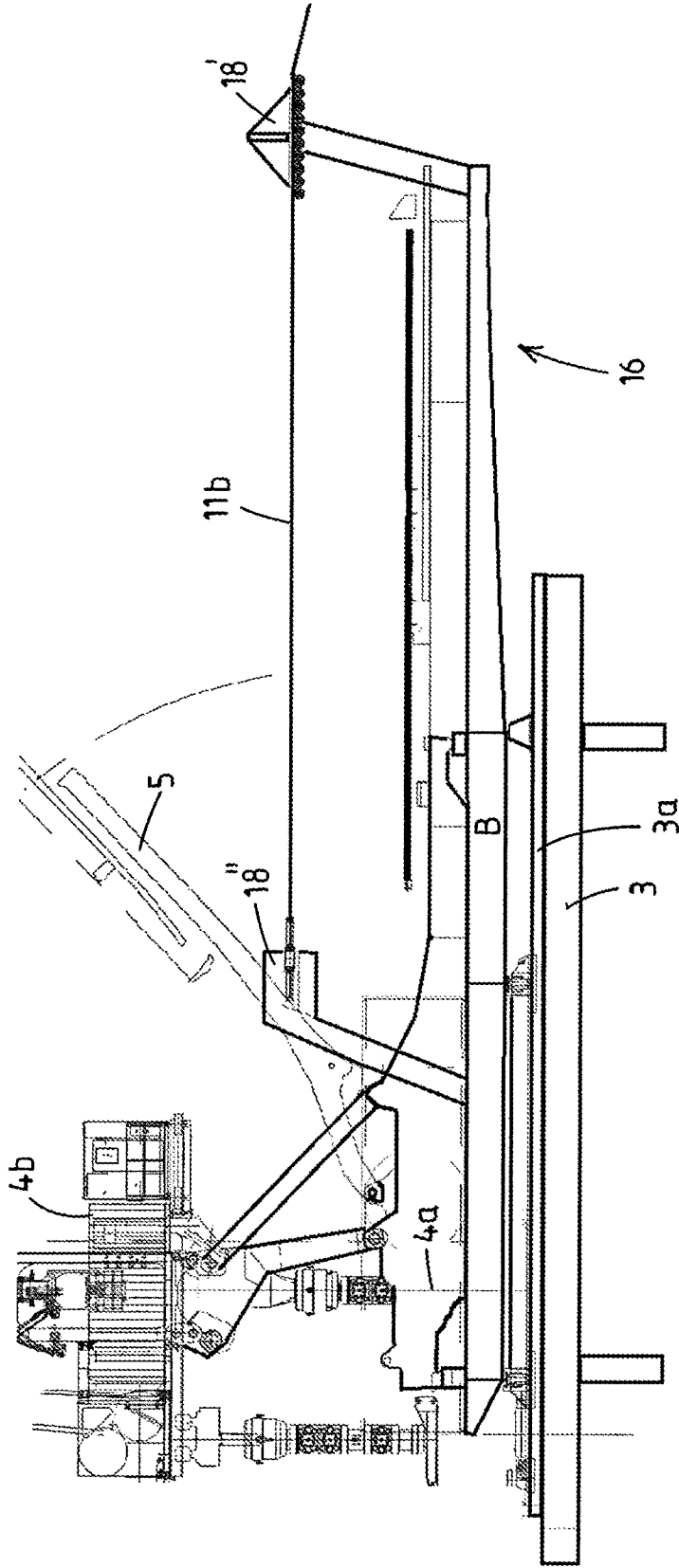


Fig.3

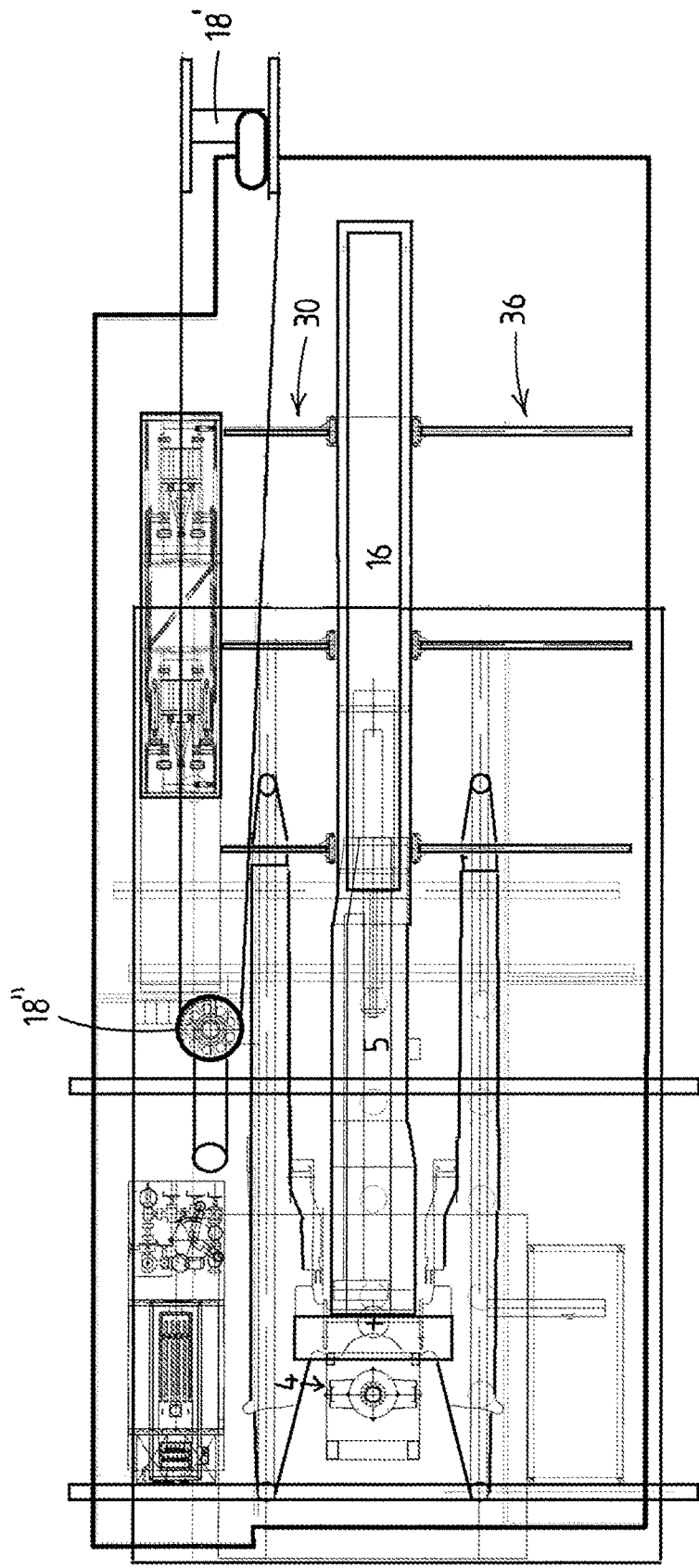


Fig.4

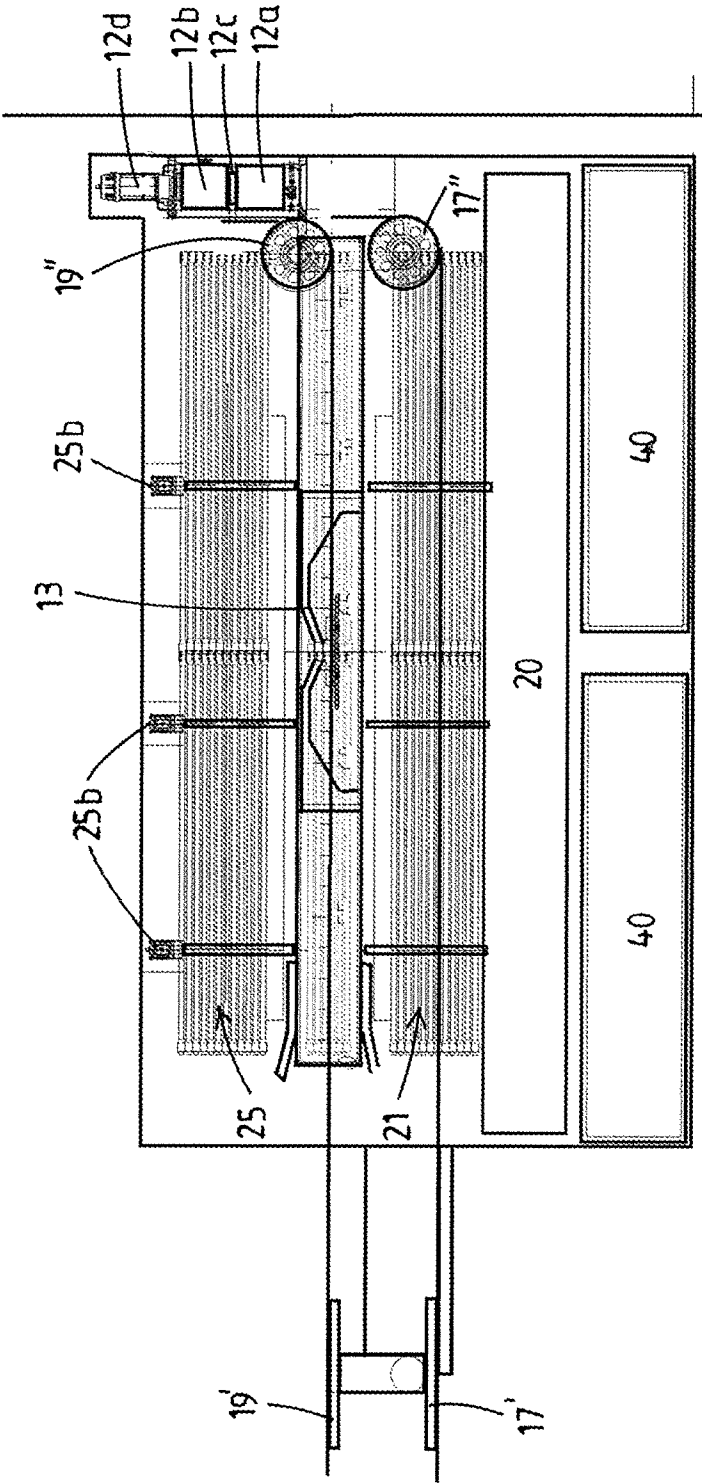


Fig.5

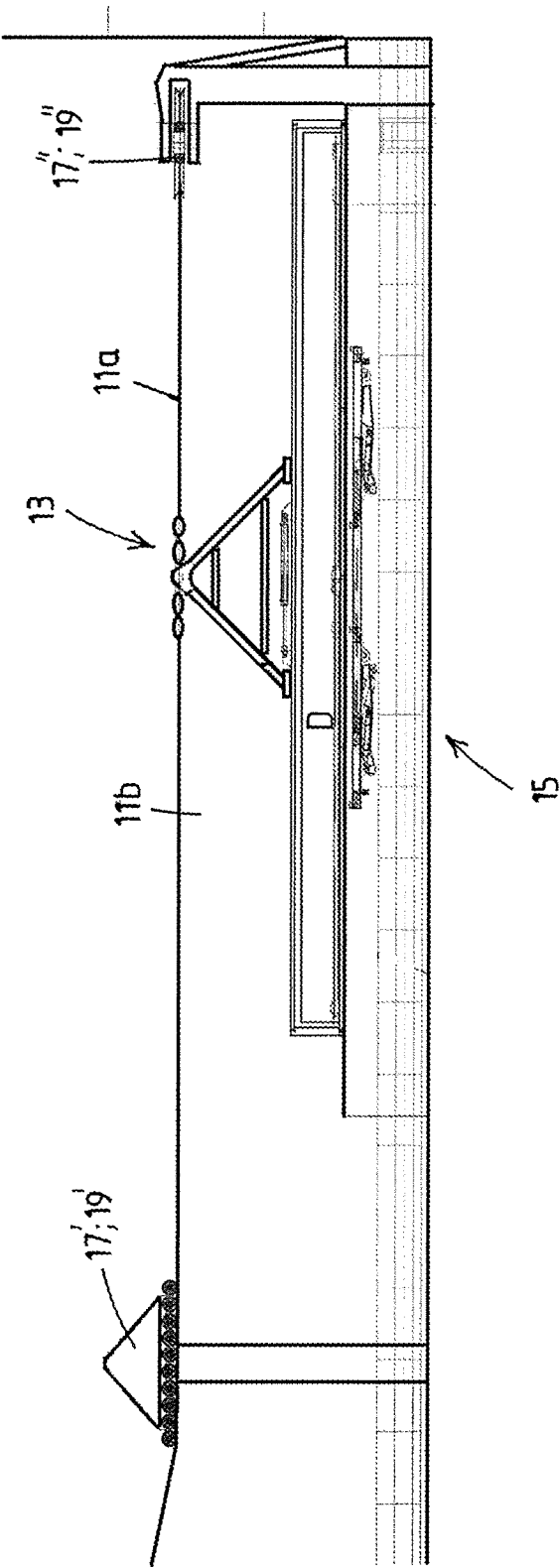


Fig.6

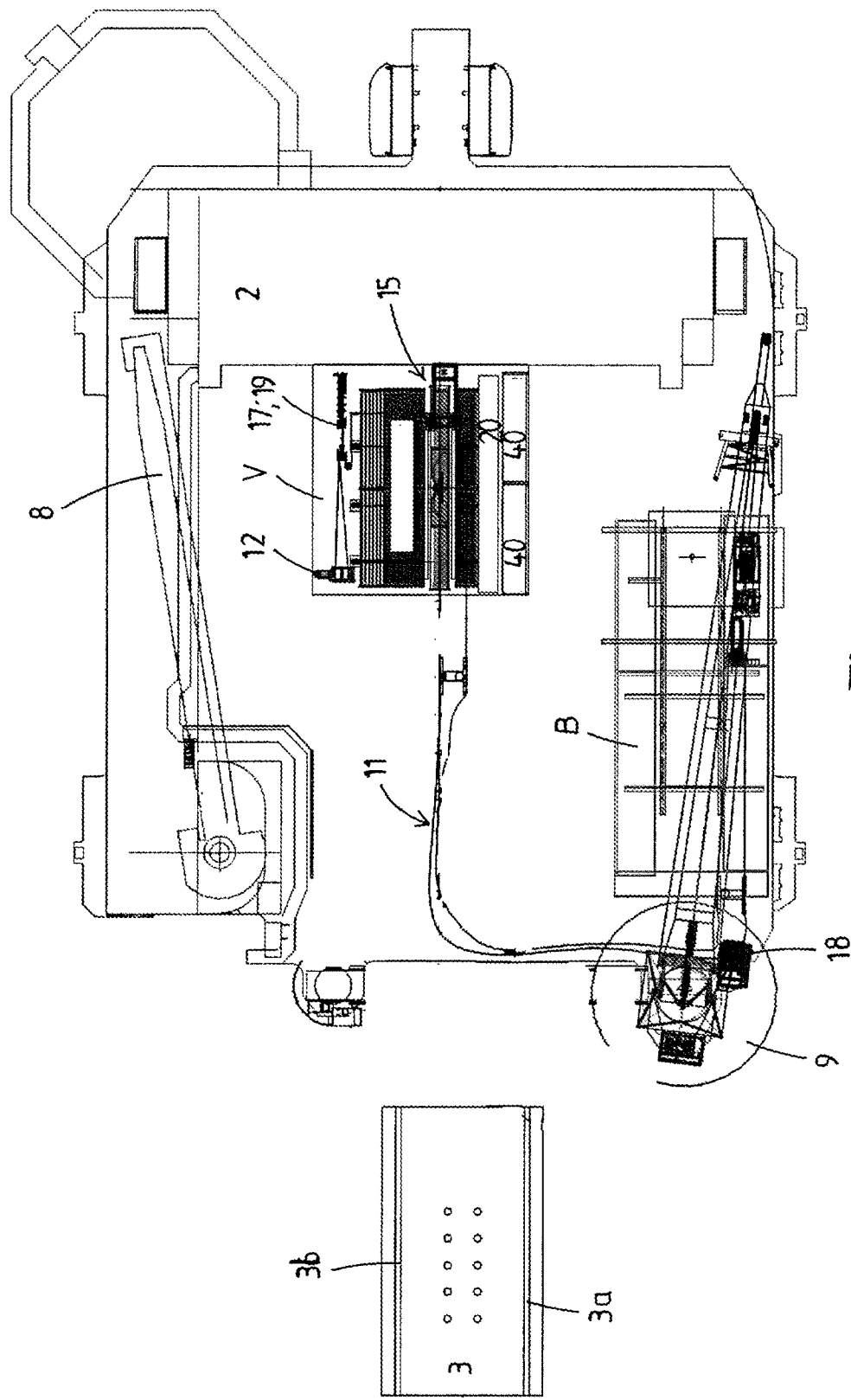


Fig. 7

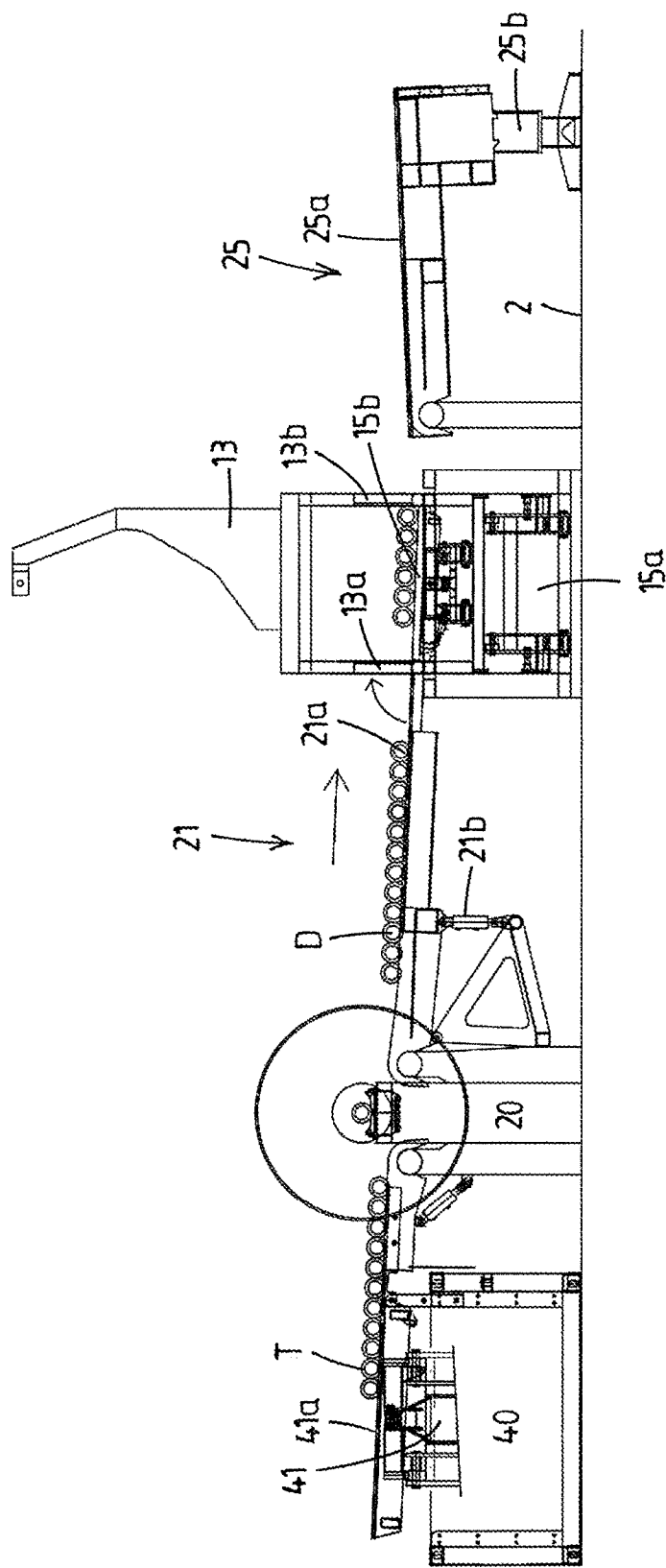


Fig.8a

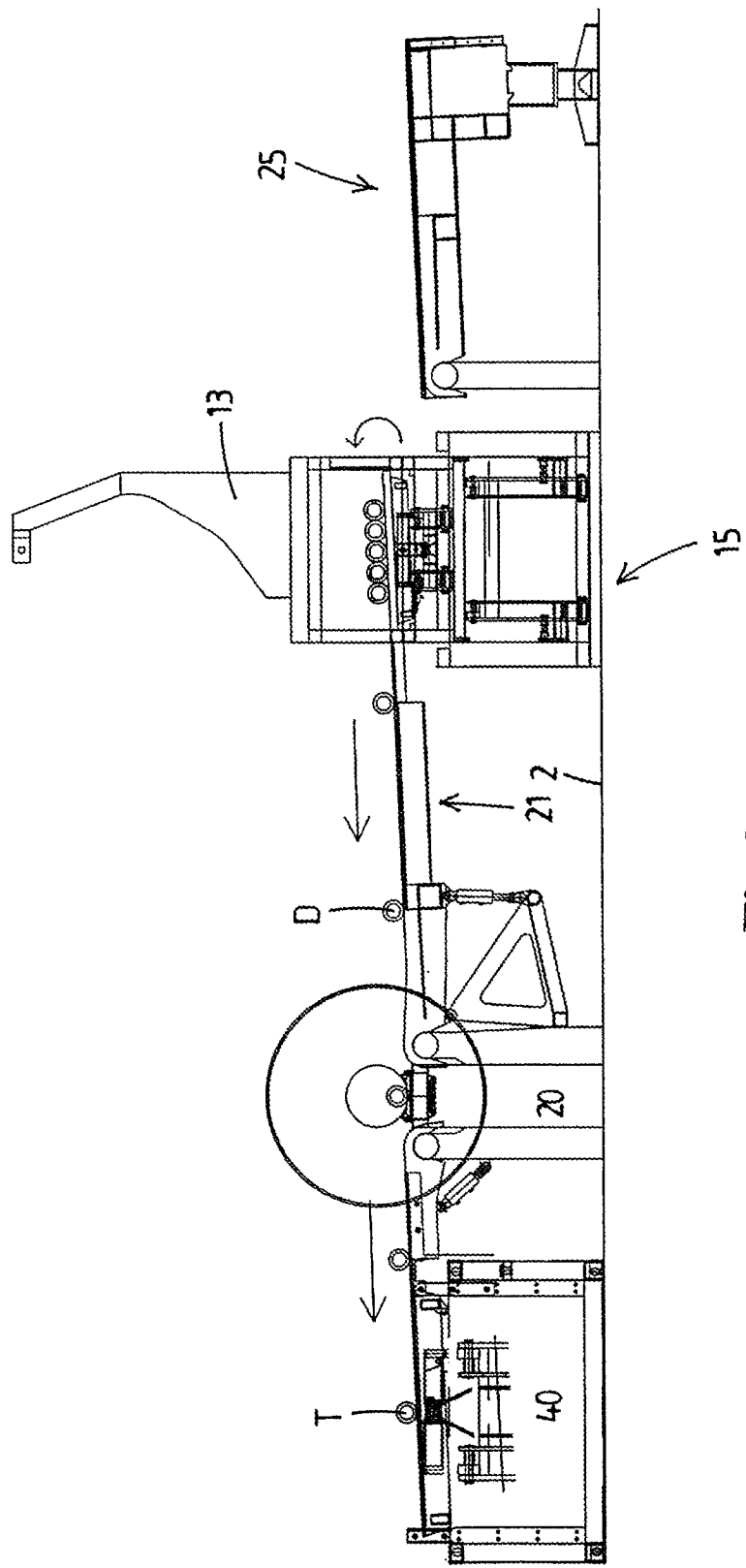


Fig.8b

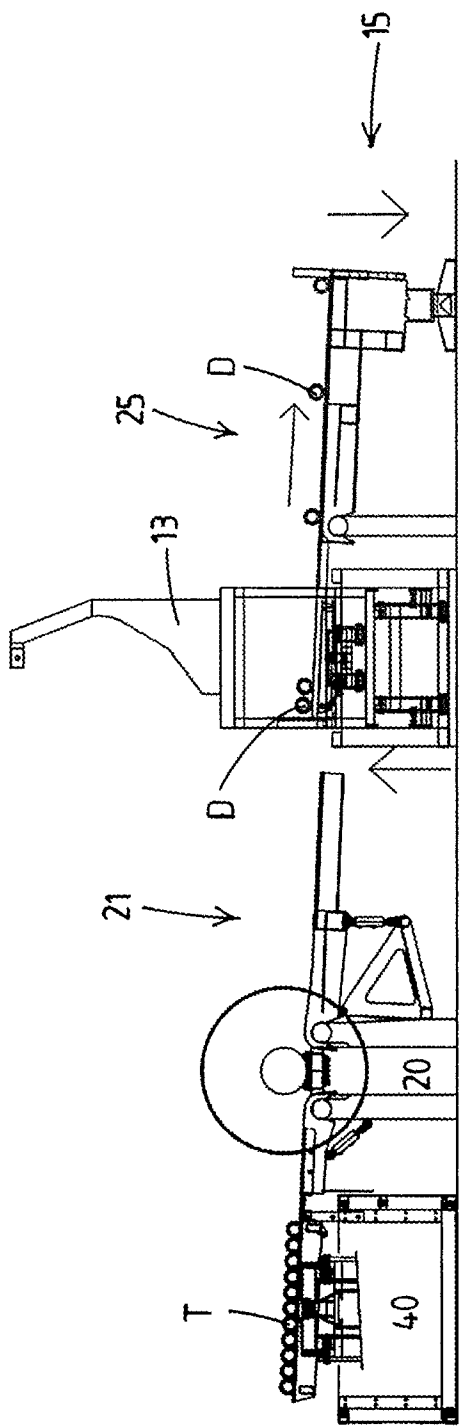


Fig. 8c

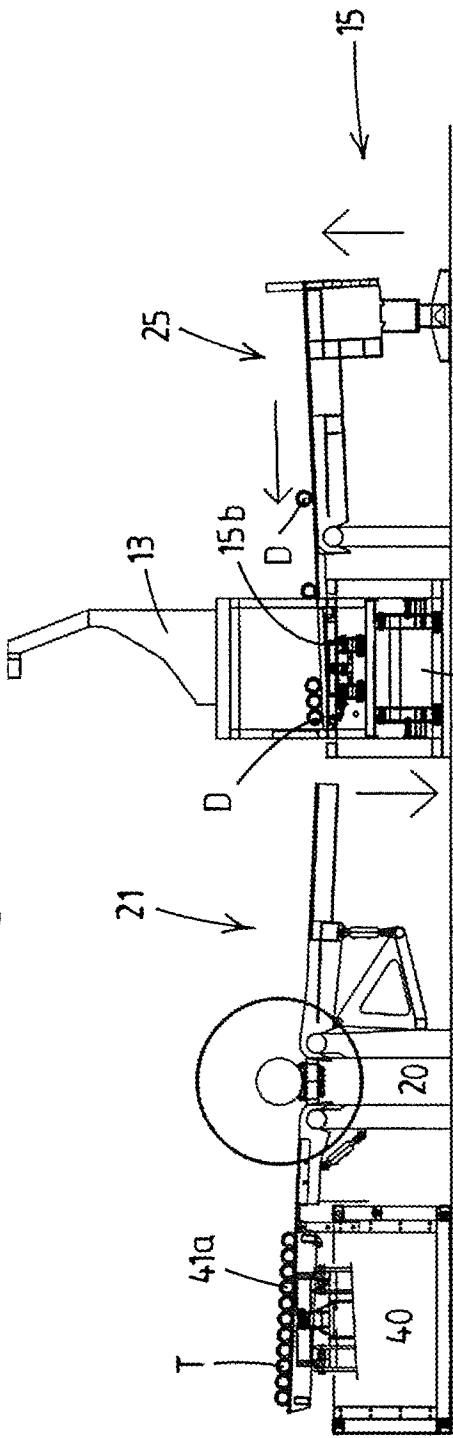


Fig. 8d

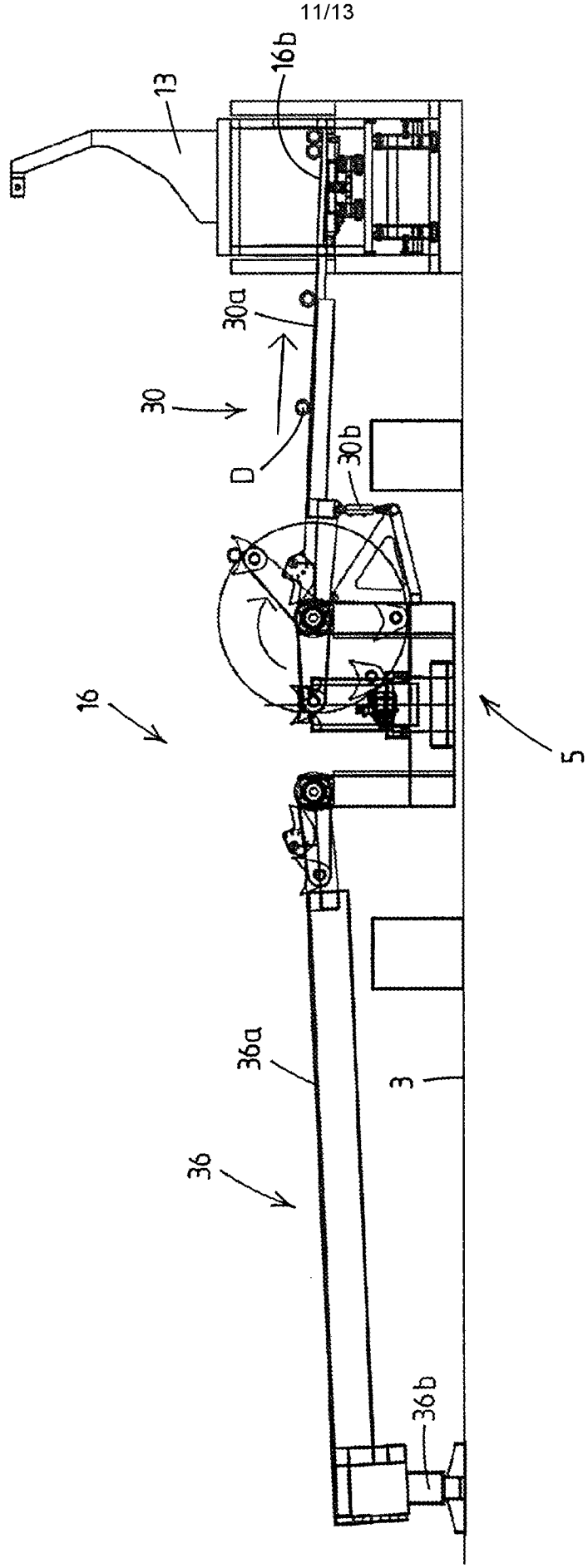


Fig.9a

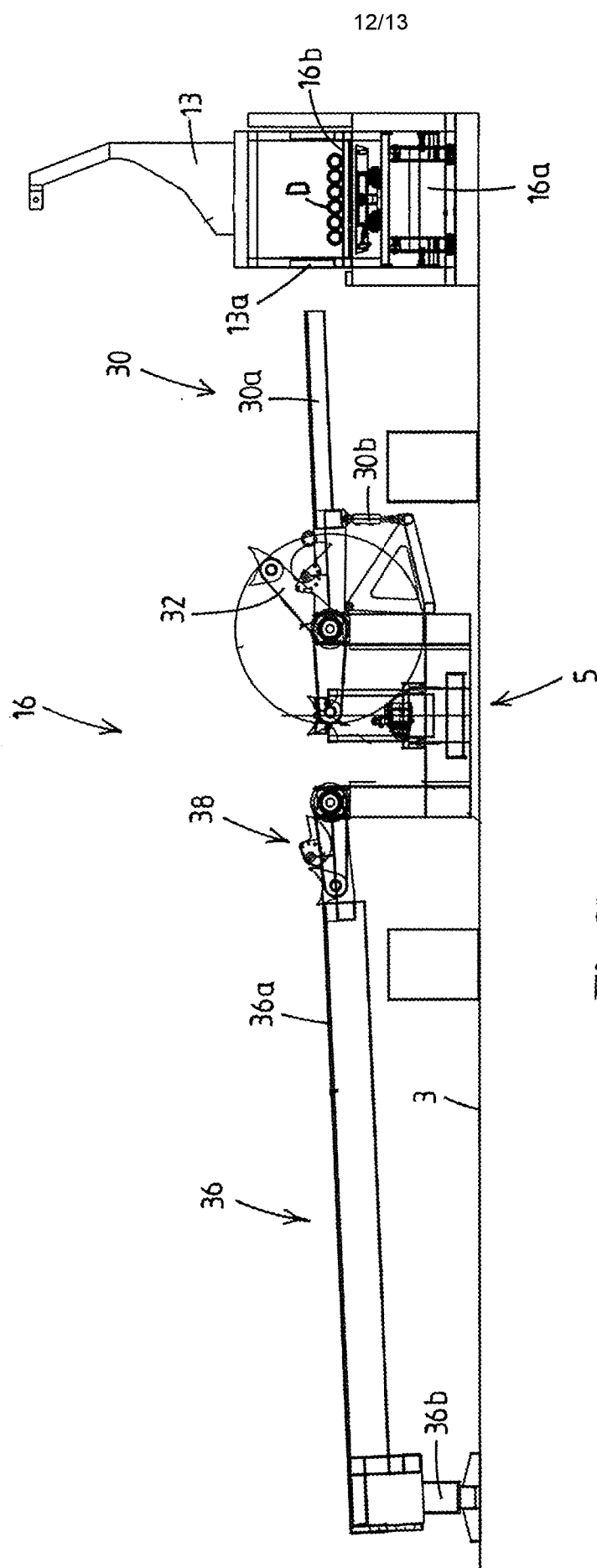


Fig. 9b

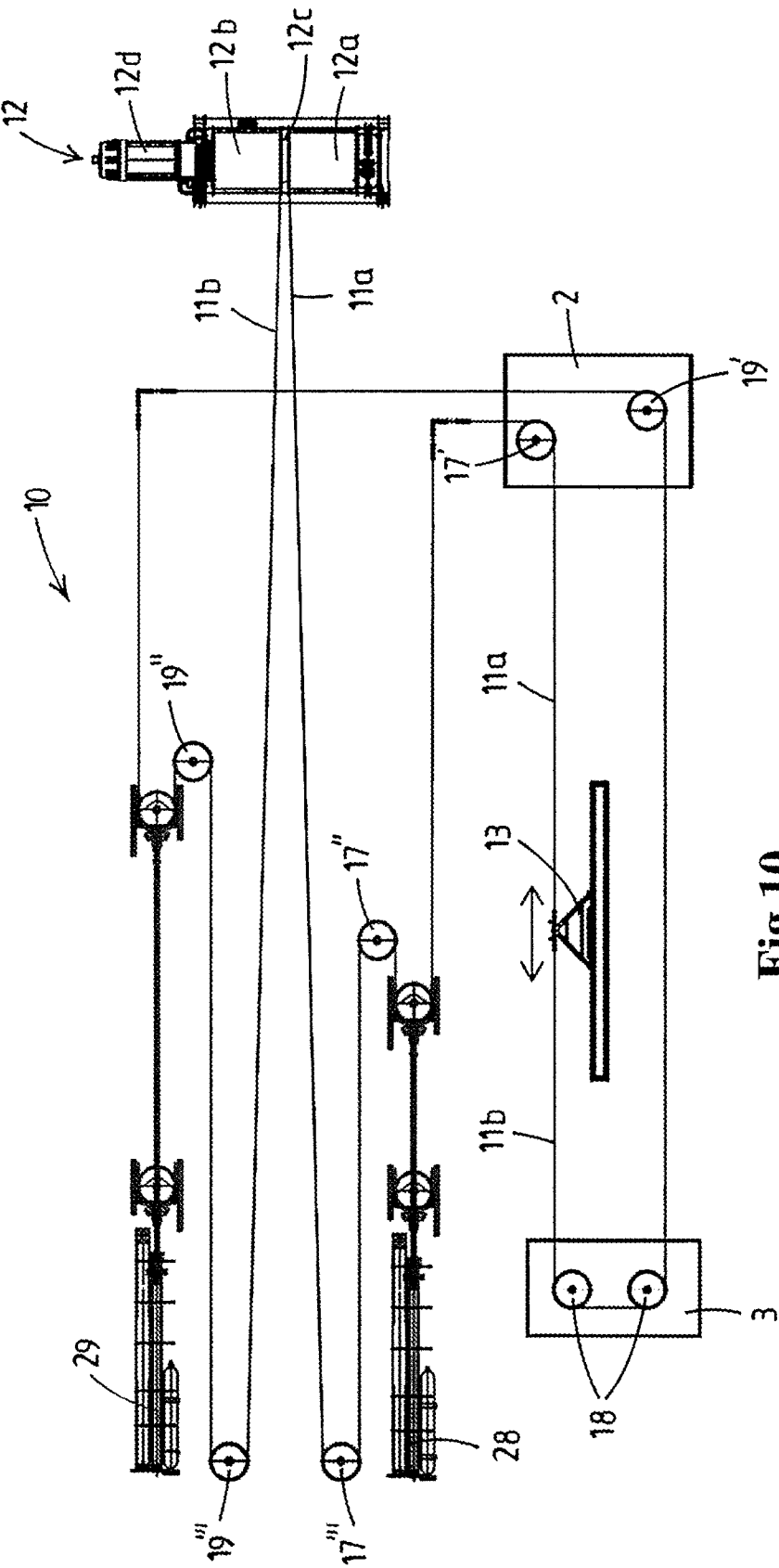


Fig.10

INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2017/050739

A. CLASSIFICATION OF SUBJECT MATTER
INV. E21B19/14
ADD.

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 B66C B63B

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 060 551 A (WESTAMARIN A S) 7 May 1981 (1981-05-07)	1-8, 11-14, 16-19 9,10,15
A	page 1, line 48 - page 2, line 43; figure 1 page 2, lines 59-64; claim 2	
Y	DE 10 2014 000041 A1 (I A U INST FÜR ARBEITSWISSENSCHAFT UND UNTERNEHMENSOPTIMIERUNG GMBH [D]) 9 July 2015 (2015-07-09)	1-8, 11-14, 16-19
A	paragraphs [0018] - [0020]; figure 1	9,10,15
A	WO 2011/018614 A2 (BREBNER PAUL [DK]) 17 February 2011 (2011-02-17) page 8, lines 8-10; figures 3a,3b,4	1-19
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Further documents are listed in the continuation of Box C.



See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

7 February 2018

Date of mailing of the international search report

22/02/2018

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Beran, Jiri

INTERNATIONAL SEARCH REPORT

International application No

PCT/NL2017/050739

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1 189 622 A (GEN ELECTRIC & ENGLISH ELECT [GB]) 29 April 1970 (1970-04-29) the whole document -----	1-19
A	GB 2 240 313 A (NORTHERN ENG IND [GB]) 31 July 1991 (1991-07-31) page 4, line 9 - page 8, line 2; figure 1 -----	1-19
A	DE 20 2014 004576 U1 (ERGOTOP L A U INST FÜR ARBEITSWISSENSCHAFT UND UNTERNEHMENSOPTIMIERUNG) 11 July 2014 (2014-07-11) the whole document -----	1-19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/NL2017/050739

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2060551 A	07-05-1981	GB 2060551 A	07-05-1981
		NO 793262 A	13-04-1981
		US 4348960 A	14-09-1982

DE 102014000041 A1	09-07-2015	NONE	

WO 2011018614 A2	17-02-2011	EP 2464812 A2	20-06-2012
		WO 2011018614 A2	17-02-2011

GB 1189622 A	29-04-1970	NONE	

GB 2240313 A	31-07-1991	CA 2030138 A1	28-06-1991
		DE 4039000 A1	04-07-1991
		GB 2240313 A	31-07-1991
		JP 2772143 B2	02-07-1998
		JP H04101997 A	03-04-1992
		NL 9002527 A	16-07-1991
		US 5117991 A	02-06-1992

DE 202014004576 U1	11-07-2014	NONE	
