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DESCRIPTION

BACKGROUND OF THE INVENTION

[0001] The present invention refers to a vessel for operating on underwater wells.

[0002] Wells and in particular underwater wells need many operations to be performed over time. Such operations include first drilling, re-drilling for workover purposes, and many other workover operations such as major maintenance or remedial treatments of the underwater wells.

[0003] Operations can be performed by means of a rig or a coil tubing frame and coiled tubing, snubbing or slickline equipment or a combination of a rig, and a coil tubing frame. In many case, these operations include a number of activities to be executed aboard the vessel such as mounting valve assemblies to a tubular string or to a coil tubing; coil tubing operations; dismounting valve assemblies from a tubular string etc.

[0004] All these operations are rendered more complicated when the vessel is connected to a wellhead and is subjected to heave movement. When a tubular string connects the wellhead to the vessel, the heave movement of the vessel may stress the wellhead, the tubular string, and the equipment of the vessel connected to the tubular string. For this reasons it is known to compensate the heave movement of the vessel to minimize the above-indentified stresses.

[0005] On this subject GB 2, 343, 466 A discloses a vessel including a main deck; and a compensation derrick mounted on the main deck. The derrick comprises a frame, a support carrier which is moveable in a direction substantially vertical with respect to the frame and is suitable to support a tubular string connected to a wellhead and a coil tubing injector, and a draw work that is connected to the support carrier and to a compensating assembly.

[0006] The vessel disclosed in GB 2,343,466 has the drawback of being dedicated to carry out coil tubing operations only and lacking flexibility.

[0007] On the contrary multi-purpose vessels operating on underwater wells need many activities to be done aboard the vessel. In particular, many heavy items are raised, positioned, lowered and assembled when suspended along the main deck. Many different structures of vessel have been proposed through time in documents US 6,343,662 B2, GB 2,175,946, GB 2, 354, 028, US 4, 200, 054, GB 2,431, 420, GB 2,085,051, US 2005/0129464.

[0008] It follows that the working conditions are rather dangerous for the operators involved in the above-identified activities aboard the vessel.

[0009] One of the objects of the present invention consists in making a vessel suitable to carry

out various activities related to operations on underwater wells and, at the same time, increasing the safety aboard the vessel.

[0010] According to the present invention there is realized a vessel for operating on underwater wells; the vessel including a main deck; a moon pool extending through the main deck; a drill deck elevated above the main deck and having a hole; a compensation unit, which is slidingly mounted on the main deck above the moon pool between the main deck and the drill deck, and comprises a frame, a support carrier with respect to the frame moveable in a direction substantially vertical and suitable to carry items, and a driving assembly that is connected to the support carrier and to the frame and is configured to be selectively set so as to displace the support carrier with respect to the frame in a heave compensation mode, and in a elevator mode; and a tower crane mounted on said drill deck and configured for rising and lowering tubular strings into the body of water through the moon pool and through the hole along an operating axis parallel to said direction.

[0011] In this way the compensation unit is a multi-purpose compensation unit and is able to operate as an elevator when the support carrier is not connected to a wellhead by a tubular string.

[0012] In this way the multi-purpose compensation unit adapts the vessel to various different operations and increases the safety of the operators working aboard the vessel.

[0013] In a preferred embodiment of the present invention the compensation unit comprises at least a hydraulic linear actuator allowing a bigger compensation range with respect to the known compensation system.

[0014] Furthermore when the support carrier is connected to the top of a tubular string, the support carrier may support a coil tubing frame and there is no need of using a slip joint with corresponding sliding seals.

[0015] The present invention further relates to a working method of a vessel for operating on underwater wells.

[0016] According to the present invention there is provided a working method of a vessel for operating on underwater wells, wherein the vessel includes a main deck; a moon pool extending through the main deck; a drill deck elevated above the main deck and having a hole; a compensation unit, which is slidingly mounted on the main deck between the main deck and the drill deck and about the moon pool and comprises a frame, a support carrier moveable with respect to the frame in a direction substantially vertical and suitable to carry items, and a driving assembly that is connected to the support carrier and to the frame; and a tower crane mounted on said drill deck and configured for rising and lowering tubular strings into the body of water through the moon pool and through the hole along an operating axis parallel to said direction; the method comprising the step of setting the driving assembly to selectively displace the support carrier with respect to the frame in said direction in a heave compensation mode;

and sliding the compensation unit in a further direction parallel to the main deck between a rest position and an operating position aligned to the operating axis.

DRAWINGS

[0017] Further technical features and advantages of the invention will be disclosed by the following detailed description of a non-limiting embodiment with reference to the enclosed drawings, wherein:

- Figure 1 is a side elevation view, with part removed for clarity and part in cross-section, of a vessel in accordance to the present invention;
- Figure 2 is a plan view, with parts removed for clarity, of the main deck of the vessel of figure 1;
- Figure 3 is a side elevation view, in an enlarged scale with parts in cross-section, and parts schematically illustrated, of a detail of the vessel of figure 1; and
- Figures 4 and 5 are axonometric views, with part removed for clarity, of the vessel of figure 1 in two respective working configurations.

DETAILED DESCRIPTION

[0018] The detailed description refers to the best embodiment of the present invention.

THE VESSEL

[0019] In figure 1 reference numeral 1 indicates a vessel floating in a body of water 2 and operating on an underwater well 3 extending into the bed 4 of the body of water 2. The well 3 has a wellhead 5 that protrudes from the bed 4 and is connected to the vessel 1 by a tubular string R. In the example shown in the enclosed figures, the vessel 1 is a semisubmersible vessel comprising large pontoon-like structures 6 submerged below the sea level SL; a main deck 7 that is elevated above the pontoon-like structures 6 on large steel columns 8 and is provided with a starboard S1; a portside S2 (figure 2); and a drill deck 9 elevated above the main deck 7 on columns 10. The main deck 7 is provided with a moon pool 11 (a large opening into the main deck 7 allowing the passage of drilling equipment). As better shown in figure 2, the moon pool 11 is delimited by a rim having a rectangular shape, and comprising two longitudinal sides 12L, and two transversal sides 12S, namely a starboard transversal side 12S and a portside transversal side 12S.

[0020] In the following description with the definition deck is defined a structure, whereas with the term surface is defined the upper face of the structure. As a consequence the main deck 7

is provided with a main surface 7A, and the drill deck 9 is provided with a drill surface 9A.

[0021] The semisubmersible vessel 1 has the advantage of submerging the pontoon-like structures 6 and minimizing loading from waves and wind. For this reasons the semisubmersible vessel 1 can operate in a wide range of water depths, including deep water. Station keeping of the semisubmersible vessel 1 can be achieved either by using a number of anchors tethered by strong chains and computer-controlled wire cables or by computer-controlled thrusters indicated with number 13 in the embodiment shown in figure 1.

[0022] Vessel 1 further comprises equipment for drilling and performing workover operations on the underwater well 3.

[0023] Even though the description refers expressly to a semisubmersible vessel the present invention is not limited to semisubmersible vessel and includes any kind of vessel like, for example, single hull vessel.

T**HE EQUIPMEN**T

[0024] With reference to figure 1, the drilling and workover equipment comprises a tower crane 14 mounted on the drill deck 9; and a draw work 15 that is mounted on the drill deck 9 and is connected to the top the of the tower crane 14 by a hauling cable 16 that defines the operating axis A of the tower crane 14. The operating axis A is vertical or substantially vertical because of the movement of the vessel 1. The drill deck 9 includes a removable panel 17 located above the moon pool 11 and a hole 18 (figure 3) that is arranged in the removable panel 17 and extends about the operating axis A.

[0025] The tower crane 14 can be any kind of tower crane such as a derrick, a ram crane, in turn equipped with top drive etc. The drill deck 9 may be equipped as well with a rotary table extending about hole 18 and any other kind of drilling equipment and devices for handling tubular members for making tubular strings R on the drill deck 9.

[0026] The draw work 15 may be advantageously connected to a compensation assembly of known type and not shown in the enclosed figures.

[0027] The equipment further comprises a compensation unit 19 mounted on the main deck 7; a dolly 20 supported by the main deck 7 and moving along the moon pool 11; a rail assembly 21 (figure 2) extending on the main deck 7 and on the dolly 20; transport carriages 22 running along the rail assembly 21; and a coil tubing frame 23 that in figure 1 is shown on the compensation unit 19.

[0028] A number of valve assemblies like a blowout preventer 25 and a christmas tree 26 arranged on respective carriages 22, and a number of reels 24 of coiled tubing are stored on the main deck 7.

THE COMPENSATION UNIT

[0029] With reference to figure 3, the compensation unit 19 is arranged above the moon pool 11, is slidingly coupled to the main deck 7 in a direction D2 parallel to the main deck 7, and is arranged between the main deck 7 and the drill deck 9. The sliding movement of the compensation unit 19 occurs between a rest position at the portside transversal side 12S (figure 2) and an operating position, wherein the compensation unit 19 is aligned to the operating axis A (figure 4). Advantageously the compensation unit 19 is in sliding engagement with the lower side of the drill deck 9.

[0030] The compensation unit 19 includes a frame 27; a support carrier 28; and a driving assembly 29 which is connected to the frame 27 and to the support carrier 28 and is suitable to operate the support carrier 28 in a heave compensation mode and in an elevator mode for raising and lowering items.

[0031] The frame 27 is tower-shaped and extends prevalently in the direction D1. The frame 27 has four uprights 30 arranged at the vertexes of a hypothetical rectangle (figure 2) and a number of beams connecting the uprights 30 along three sides only of the hypothetical rectangle in order to form a truss structure extending along three side, The frame 27 has an open side facing starboard S1 of the main deck 7 (figure 2).

[0032] The support carrier 28 is slidingly supported by the uprights 30 in the direction D1 parallel to the uprights 30 and comprises a plate 31. With reference to figure 2, the plate 31 has a rectangular outer edge, a central hole 32, and a slit 33 connecting the central hole 32 to the outer edge at the open side of the frame 27. In other words, the slit 33 extends from the central hole 32 toward starboard S1. In particular, the slit 33 is parallel to direction D2 and to the sliding movement of the compensation unit 19.

[0033] The plate 31 further comprises a spool of jumper hoses (not shown) so has to fluidically connect the jumper hoses to fixed lines (not shown) arranged along the main deck 7.

[0034] The driving assembly 29 comprises four driving mechanisms 34 each arranged at a respective upright 30. Each driving mechanism 34 is substantially a lifting tackle operated by a hydraulic linear actuator 35 and comprises a rope 36 having one end fixed to the top of the frame 27 and the other end fixed to the support carrier 28; a pulley 37 fixed to the top of the frame 27 above the support carrier 28; and a pulley 38 fixed to the moving end of the hydraulic linear actuator 35 which is fixed to the top of the frame 27.

[0035] The driving assembly 29 further comprises a compensation reservoir 39 operating according to the principle of the constant load, and a hydraulic circuit 40 connecting the hydraulic linear actuators 35 to the compensation reservoir 39. In other words, the hydraulic linear actuators 35 are operated by a liquid, usually oil, which is in communication with the

compensation reservoir 39 through the hydraulic circuit 40. The compensation reservoir 39 is provided with two compartments tightly divided by a moveable wall 41. The oil fills the hydraulic linear actuators 35 and one compartment, whereas a large volume of gas occupies the other compartment of the compensation reservoir 39. Since the volume of oil is negligible with respect to the volume of gas, the variations of pressure of the gas are negligible even when relatively large displacements of the moveable wall 41 occur. As a consequence, also the pressure of the oil is kept substantially constant and the load applied to the support carrier 28 is kept constant.

[0036] Once the support carrier 28 is connected to the wellhead 5 by the tubular string R as shown in figure 1, the load variation induced by the heave movement of the vessel 1 is transmitted from the wellhead 5 through the tubular string R to the plate 31 and to hydraulic linear actuators 35. As a consequence, any time a heave movement occurs, the driving assembly 29 allows the displacement of the support carrier 28 while keeping constant the load on the wellhead 5.

[0037] In addition to the heave compensation mode, the compensation unit 19 may operate in an elevator mode for raising and lowering items. For this purpose and with reference to figure 3, the hydraulic circuit 40 further includes a valve 42 for isolating the hydraulic linear actuators 35 from the compensation reservoir 39; a hydraulic pump 43; a tank 44, and a two way valve 45 having three operating positions for varying the length of the hydraulic linear actuators 35 and the height of the support carrier 28 with respect to the main deck 7 upon request.

[0038] In other words, an operator by actuating valves 42 ad 45 may set the driving unit 29 in two operating modes: the compensation mode, and the elevator mode,

[0039] In figure 1 the tubular string R is hung to plate 31 by means of a spider 46 and a gimble 47. The spider 46 and the gimble 47 are well known mechanisms for gripping tubular strings, whereas the gimble 47 is a well know type of mechanism that is used for allowing swinging movement of the tubular string R with respect to the spider 46.

[0040] In this way, the compensation unit 19 may conveniently slide back and forth in direction D2 even when the tubular string R is hung to the support carrier 28 and is connected to wellhead 5.

[0041] With reference to figure 2, the compensation unit 19 may slide on the main deck 7 from the rest position at the portside transversal side 12S of the moon pool 11 to an operating position at the centre of the moon pool 11 where the central hole 32 of plate 31 is aligned with axis A.

[0042] The main deck 7 is provided with tracks 48 arranged at opposite sides of the moon pool 11. In particular, each track 48 runs along the main deck 7 in close proximity of, and parallel to a respective longitudinal side 12L of the moon pool 11.

[0043] With reference to figure 3, the drill deck 9 supports a pair of tracks 49, which are arranged under the drill deck 9 and are parallel to track 48 for slidingly engaging the upper portion of the compensation unit 19.

[0044] The compensation unit 19 is further equipped with any suitable actuating mechanism (not shown) to displace the compensation unit 19 along the main deck 7 back and forth in the direction D2.

THE DOLLY

[0045] With reference to figure 2, the dolly 20 is a plate in sliding engagement with a pair of rails 50 running along the longitudinal sides 12L of the moon pool 11 in the direction D2. The dolly 20 is further equipped with any suitable actuator (not shown) to displace the dolly 20 along the moon pool 11 from a rest position shown in figure 2 and any other position along the moon pool 11. In its rest position the dolly 20 is in abutment against the starboard side 12S of the moon pool 11, whereas in a particular operating position the dolly 20 is in alignment to the operating axis A.

[0046] For example, a not shown actuating mechanism for the compensation unit 19 and for the dolly 20 may include a rack and pinion transmission and an electric motor connected to the pinion.

[0047] The dolly 20 has an operating upper surface flush with the main surface 7A. This condition allows transferring easily heavy and burdensome items from the main deck 7 to the dolly 20 simply by sliding them along the main surface 7A and the adjacent upper surface of the dolly 20.

THE RAIL ASSEMBLY

[0048] With reference to figure 2, the rail assembly 21 extends along the main deck 7 and along the dolly 20 and has the purpose of facilitating the handling of equipment, such as the coil tubing frame 23, the blowout preventer 25 and the christmas tree 26, stored on the main deck 7. The rail assembly 21 includes a number of straight lines 51, 52, 53, and 54 each made of a pair of parallel rails. Line 51 extends along the main deck 7 and along the dolly 20 (when the dolly 20 is arranged in the rest position) and is perpendicular to the direction of tracks 48 and 49 and rails 50.

[0049] Lines 52, 53 and 54 are parallel to D2, are arranged on the main deck 7, and are perpendicular to line 51, and cross line 51. In particular, line 54 extends partly on the dolly 20 and crosses line 51 on the dolly 20.

[0050] The rail assembly 21 is travelled by the transport carriages 22, and the coil tubing frame 23.

[0051] The displacement of the carriages 22 along the rail assembly 21 is actuated by means any suitable actuating mechanism such a rack and pinion transmission and an electric motor connected to the pinion (not shown in the enclosed figures).

THE COIL TUBING FRAME

[0052] With reference to figure 4 and 5, the coil tubing frame 23 extends prevalently in vertical direction and comprises a number of floors 55 arranged one above the others; uprights 56 connecting the floors 55; stairs permitting the operating personnel to reach the different floors 55; and banisters.

[0053] The coil tubing frame 23 is further equipped with valve assemblies for connecting the coil tubing to jumper hoses, a coil tubing injector, and several other equipment not shown in the enclosed drawings.

[0054] The lowest floor 55 is suitable to skid along the rail assembly 21 and to be locked in a given position on the support carrier 28. The coil tubing frame 23 can be suspended above the moon pool 11 by means of the tower crane 14 and a sling 57 as shown in figure 1.

THE WORKING ACTIVITIES OF THE VESSEL

[0055] The vessel 1 has the functions of carrying several operations on underwater wells either at the first drilling or re-drilling for workover purposes.

[0056] These operations can be performed mainly either by means of the tower crane 14 or by means of the compensation unit 19 operating according to the compensation mode or by means of the tower crane 14 in co-operation with the compensation unit 19.

[0057] Further to the compensation function, the compensation unit 19 has the functions of displacing and raising items above the moon pool 11 when operated in the elevator mode and disconnected from the wellhead 5 (figure 1).

[0058] In figure 4, the support carrier 28 is connected to a tubular string R, whereas the blowout preventer 25 is lying on the plate 31 of the support carrier 28. Operations of connecting the tubular string R to the blowout preventer 25 are performed on the plate 31 by the operators. The transfer of the blowout preventer 25 from a rest position on the main deck 7 shown in figure 2 to the position on plate 31 shown in figure 4 includes the following steps:

- displacing the compensation unit 19 from the operating position to the rest position

together with a tubular string R hung to the support carrier 28;

- displacing the blowout preventer 25 along line 53 by means of the support carriage 22 up to cross line 51 (figure 2);
- displacing the support carriage 22 with the blowout preventer 25 along line 51 on the dolly 20;
- displacing the dolly 20 together with the carriage 22 and the blowout preventer 25 along the moon pool 11 up to arrange the blowout preventer 25 along axis A;
- raising the blowout preventer 25 by means of the tower crane 14 (figure 4);
- displacing back the dolly 20 together with carriage 22 in the rest position (figure 4);
- displacing the compensation unit 19 in the operating position along axis A together with the tubular string R and with plate 31 arranged below the suspended blowout preventer 25 (figure 4);
- lowering the blowout preventer 25 on plate 31 by means of the tower crane 14 (figure 4).

[0059] A similar succession of steps is undertaken for transferring the coil tubing frame 23 from the rest position shown in phantom in figure 2 to the operating position shown in figure 1. An intermediate position is shown in figure 5 where the coil tubing frame 23 is lying on the dolly 20.

[0060] During the transfer of the coil tubing frame 23, the panel 17 of the drill deck 9 is removed to let the coil tubing frame 23 extend over the drill deck 9 because of the considerable height of the coil tubing frame 23.

THE ADVANTAGES

[0061] The main advantages of the present invention consist in limiting the hanging of heavy items above the main deck and, more generally, in improving the safety conditions aboard the vessel 1 in connection with multipurpose activities. Particularly relevant for these achievements are the dual mode operating compensation unit 19, the sliding arrangement of the compensation unit 19 along the main deck 7, the dolly 20, the rail assembly 21; the mutual arrangements of the tower crane 14, the compensation unit 19, and the dolly 20 that co-operate in coordinated manner to transfer heavy items.

[0062] However, the compensation unit 19 alone when mounted on the main deck 7 may achieve considerable improvements for the displacement of heavy items. In particular according to a variation of the best embodiment the plate 31 can be aligned to the main deck 7 or, better said, the dolly can be brought to a level at which the upper surface of the plate 31 is flush with the main surface 7A.

[0063] According to the present invention heavy and burdensome items are suspended for a relatively short time and only along axis A. There is no need to displace the items in horizontal

direction above the main deck while suspended and oscillations of the suspended items are small.

[0064] It is intended that many modifications can be done to the best embodiment of the present invention as described without departing from the scope of protection defined by the following claims.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

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PATENTKRAV

1. Fartøj til drift på undervandsbrønde; hvor fartøjet (1) omfatter et hoveddæk (7); en månepool (11), der strækker sig gennem hoveddækket (7); et boredæk (9), som er hævet over hoveddækket (7) og har et hul (18); en kompensationsenhed (19), der er glidende monteret på hoveddækket (7) over månepoolen (11) mellem hoveddækket (7) og boredækket (9) og omfatter en ramme (27), en støttebærer (28), der er bevægelig i forhold til rammen (27) i en retning (D1), der i det væsentlige er lodret og egnet til at bære genstande, og en drivenhed (29), der er forbundet til støttebæreren (28) og til rammen (27) og er konfigureret til at være selektivt indstillet til at forskyde støttebæreren (28) i forhold til rammen (27) i en hævekompensationstilstand og i en opløftningstilstand; og en tårnkran (14), som er monteret på boredækket (9) og konfigureret til at hæve og sænke rørformede strenge (R) ind i vandmassen (2) gennem månepoolen (11) og gennem hullet (18) langs en betjeningsakse (A), som er parallel med nævnte retning (D1).

2. Fartøj ifølge krav 1, hvor støttebæreren (28) omfatter en plade (31) til at bære genstande.

3. Fartøj ifølge krav 2, hvor støttepladen (31) har et hul (32) til ophængning af rørformede strenge (R) i støttepladen (31); hvor nævnte rørformede streng (R) strækker sig gennem månepoolen (11).

4. Fartøj ifølge krav 3, hvor støttepladen (31) har en ydre kant og en spalte (33), der løber fra den ydre kant til hullet (32); hvor spalten (33) er dimensioneret således, at rørformede strenge (R) kan passere igennem.

5. Fartøj ifølge krav 4, hvor rammen (27) har en åben side; idet nævnte spalte (33) strækker sig fra hullet (32) hen mod den åbne side.

6. Fartøj ifølge et hvilket som helst af de foregående krav, hvor rammen (27) er glidende koblet til hoveddækket (7) i en yderligere retning (D2) parallelt med hoveddækket for at arrangere støttebæreren (28) i en række positioner over månepoolen (11).

7. Fartøj ifølge krav 6, hvor støttebæreren (28) omfatter en plade (31), som er forsynet med et hul (32) til ophængning af rørformede strenge (R) og en spalte (33) til indsættelse af den rørformede streng (R) gennem pladen (31); idet nævnte spalte (33) strækker sig i nævnte yderligere retning (D2).

8. Fartøj ifølge et hvilket som helst af de foregående krav, hvor drivenheden (29) i det mindste omfatter en drivmekanisme (34), som forbinder rammen (27) til støttebæreren (28) og inkluderer en hydraulisk lineær aktuator (35); et kompensationsreservoir (39), der fungerer efter princippet om konstant belastning; en hydraulisk pumpe (43); og et hydraulisk kredsløb (40) til selektivt at forbinde den hydrauliske aktuator (35) til kompensationsreservoiret (39) for at betjene støttebæreren (28) i kompensationstilstand og til den hydrauliske pumpe (43) for at betjene støttebæreren (28) i opløftningstilstand.

9. Fartøj ifølge et hvilket som helst af de foregående krav, hvor rammen (27) glidende griber ind i første spor (48), der strækker sig langs hoveddækket (7); og fortrinsvis andre spor (49), der strækker sig langs boredækket (9).

10. Fartøj ifølge krav 9, hvor boredækket (9) omfatter et aftageligt dækpanel (17), der strækker sig over månepoolen (11), for at lade den genstand, som bæres af støttebæreren (28), rage ud over boredækket (9).

11. Arbejdsmetode for et fartøj til drift på undervandsbrønde, hvor fartøjet (1) omfatter et hoveddæk (7); en månepool (11), der strækker sig gennem hoveddækket (7); et boredæk (9), som er hævet over hoveddækket (7) og med et hul (18); en kompensationsenhed (19), der er glidende monteret på hoveddækket (7) mellem hoveddækket (7) og boredækket (9) og omkring månepoolen (11) og omfatter en ramme (27), en støttebærer (28), der kan bevæges i forhold til rammen (27) i en retning (D1), der i det væsentlige er lodret og egnet til at bære genstande, og en drivenhed (29), der er forbundet til støttebæreren (28) og til rammen (29); og en tårnkran (14), som er monteret på boredækket (9) og konfigureret til at hæve og sænke rørformede strenge (R) ind i vandmassen (2) gennem månepoolen (11) og gennem hullet (18) langs en betjeningsakse (A), som er parallel med nævnte retning (D1); hvilken metode omfatter et trin med at indstille drivenheden (29) til selektivt at forskyde støttebæreren (28) i forhold til rammen (27) i nævnte retning (D1) i en hævekompensationstilstand; og glide kompensationsen-

heden (19) i en yderligere retning (D2) parallelt med hoveddækket (7) mellem en hvileposition og en arbejdsposition, der flugter med arbejdsaksen (A).

12. Metode ifølge krav 11, som omfatter et trin med ophængning af en rørformet streng (R) i støttebæreren (28).

13. Metode ifølge krav 11 eller 12, hvor støttebæreren (28) har en støtteplade (31), der har en ydre kant, et hul (32) og en spalte (33), der løber fra hullet (32) til den ydre kant; hvilken metode omfatter et trin med kobling af den rørformede streng (R) til støttepladen (31) ved lateralt at indsætte den rørformede streng (R) gennem spalten (33) i den yderligere retning (D2) i det væsentlige vandret.

14. Metode ifølge et hvilket som helst af kravene 11 til 13, som omfatter et trin med at glide kompensationsenheden (19) langs hoveddækket (7) i den yderligere retning (D2) i det væsentlige vandret for at anbringe støttebæreren (28) i et antal positioner over månepoolen (11).

15. Metode ifølge krav 14, som omfatter et trin med at ophænge en rørformet streng (R) i støttebæreren (28) og glide kompensationsenheden (19) på hoveddækket (19), mens den rørformede streng (R) er ophængt i støttebæreren (28).

16. Metode ifølge et hvilket som helst af kravene fra 11 til 15, som omfatter et trin med at køre en dolly (20) langs månepoolen (11); idet dollyen (20) glidende kobles til hoveddækket (7).

17. Metode ifølge et hvilket som helst af kravene fra 11 til 16, som omfatter et trin med at overføre en genstand, fx en spiralrørramme (23) eller en udblæsningsforhindrer (25) eller et juletræ (26), fra en hvileposition på hoveddækket (7) til en arbejdsposition på støttebæreren (28) ved hjælp af en dolly (20), som er anbragt over månepoolen (11); hvor tårnkranen (14) arbejder langs den givne akse (A) over månepoolen (11), og kompensationsenheden (19); hvor metoden fortrinsvis omfatter et trin med at overføre nævnte genstand fra hoveddækket (7) til dollyen (20) ved hjælp af en skinneenhed (21), der strækker sig langs hoveddækket (7) og dollyen (20).

DRAWINGS

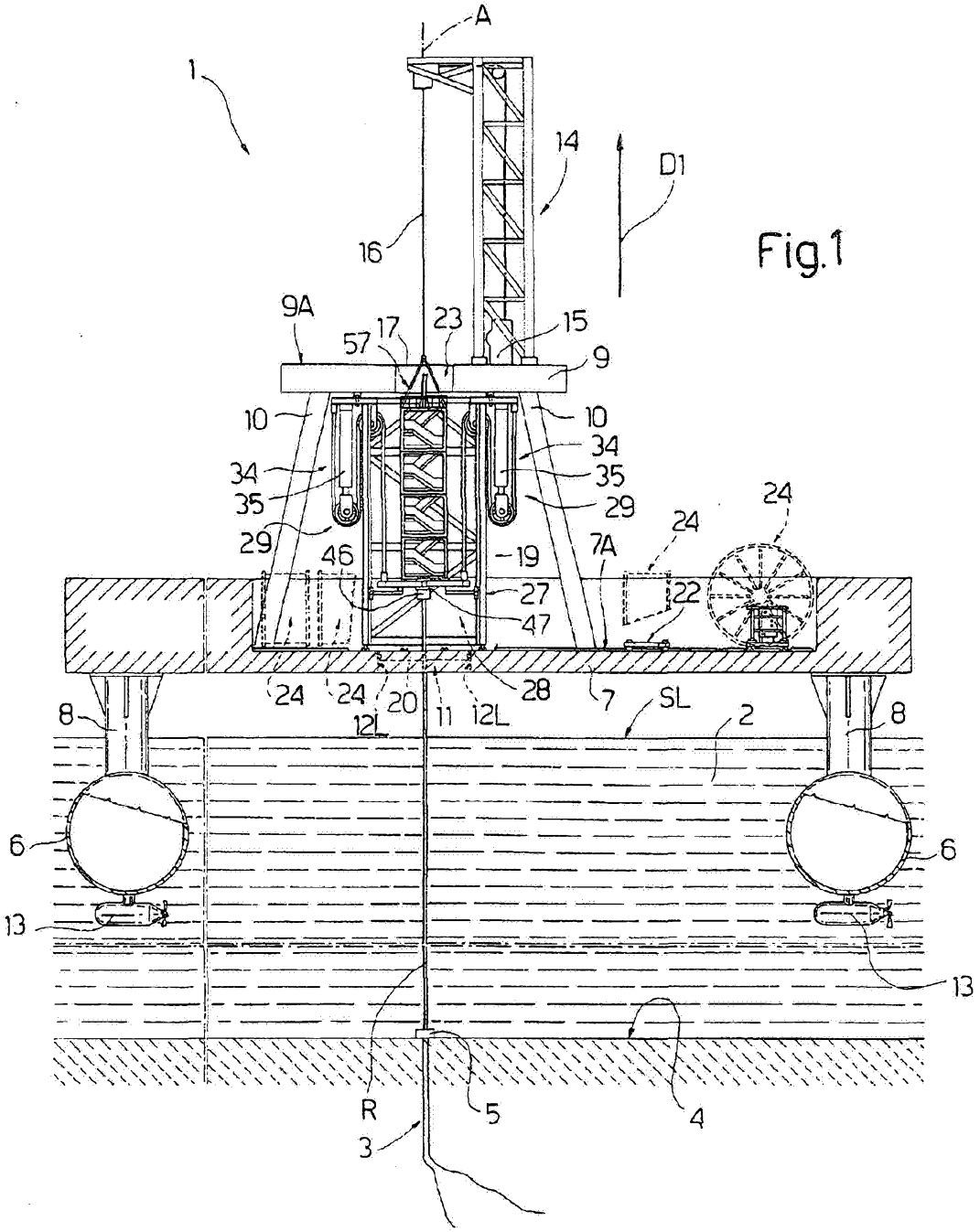


Fig.1

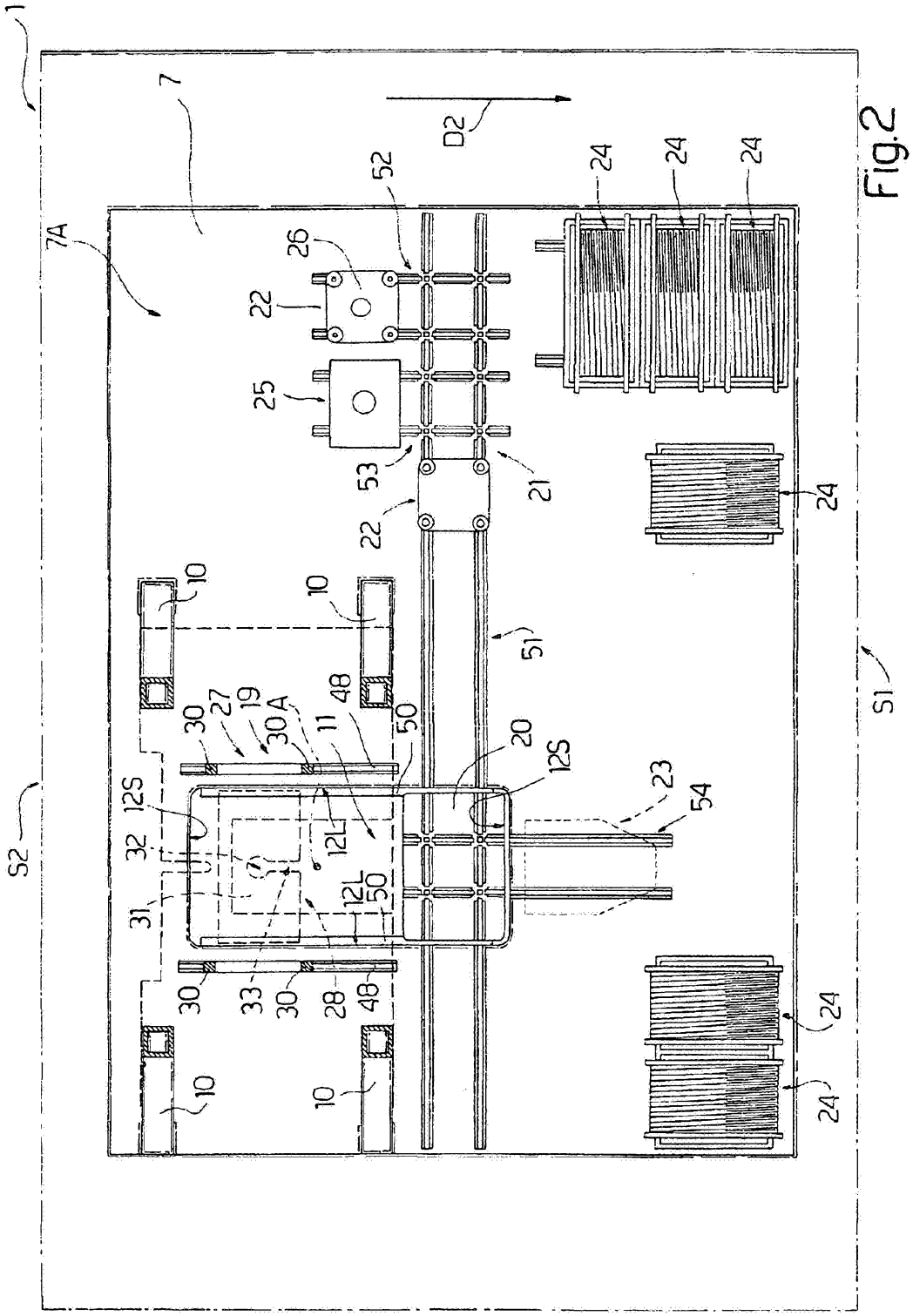
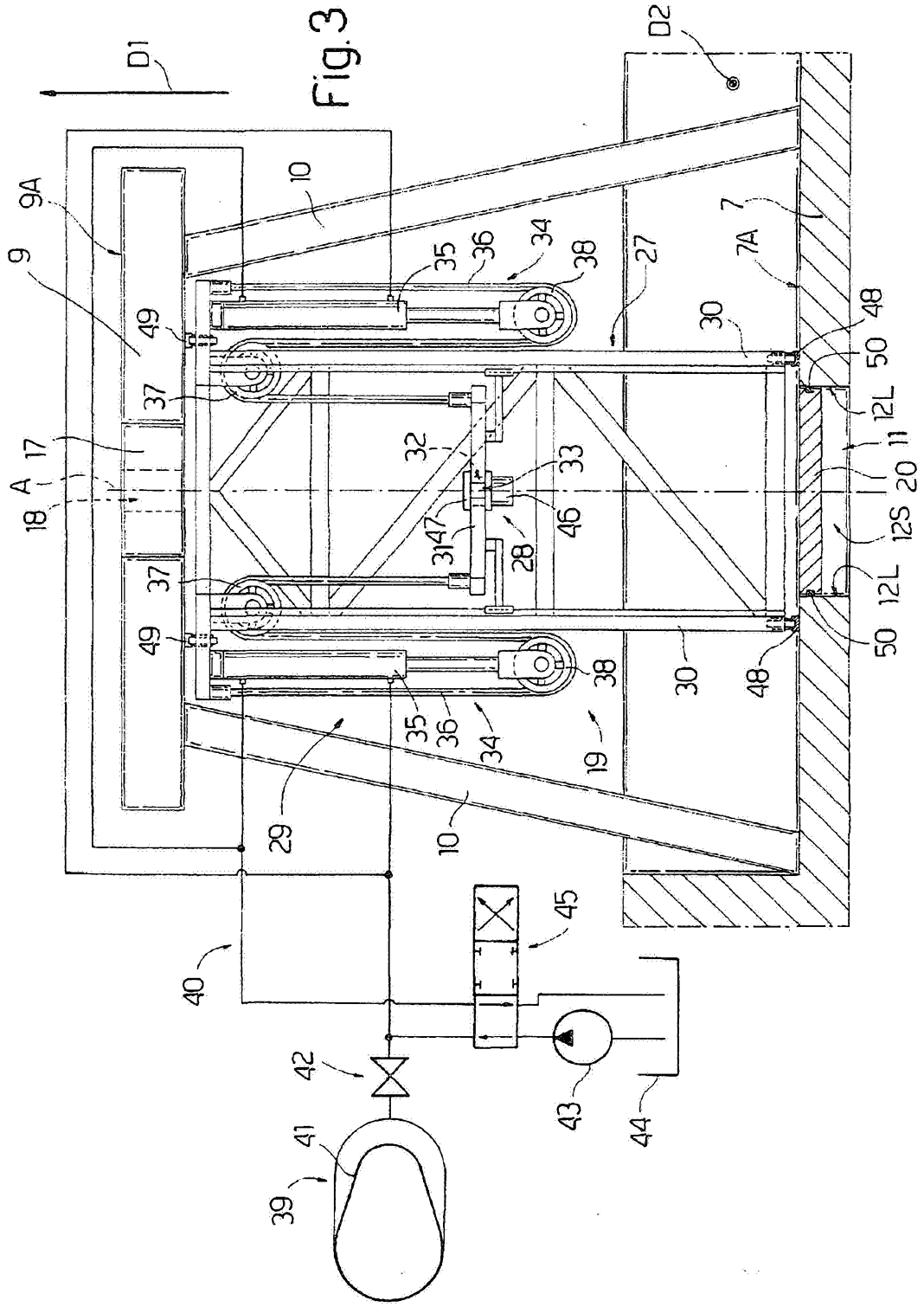

1
7
7A
D2
52
24
26
22
25
53
21
10
51
S1
S2
27
19
30A
48
11
50
20
12S
23
54
32
12L
31
33
28

Fig.2

Fig.3


D1
D2
9A
9
10
49
37
17
A
18
32
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35
36
34
38
27
7
7A
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12L
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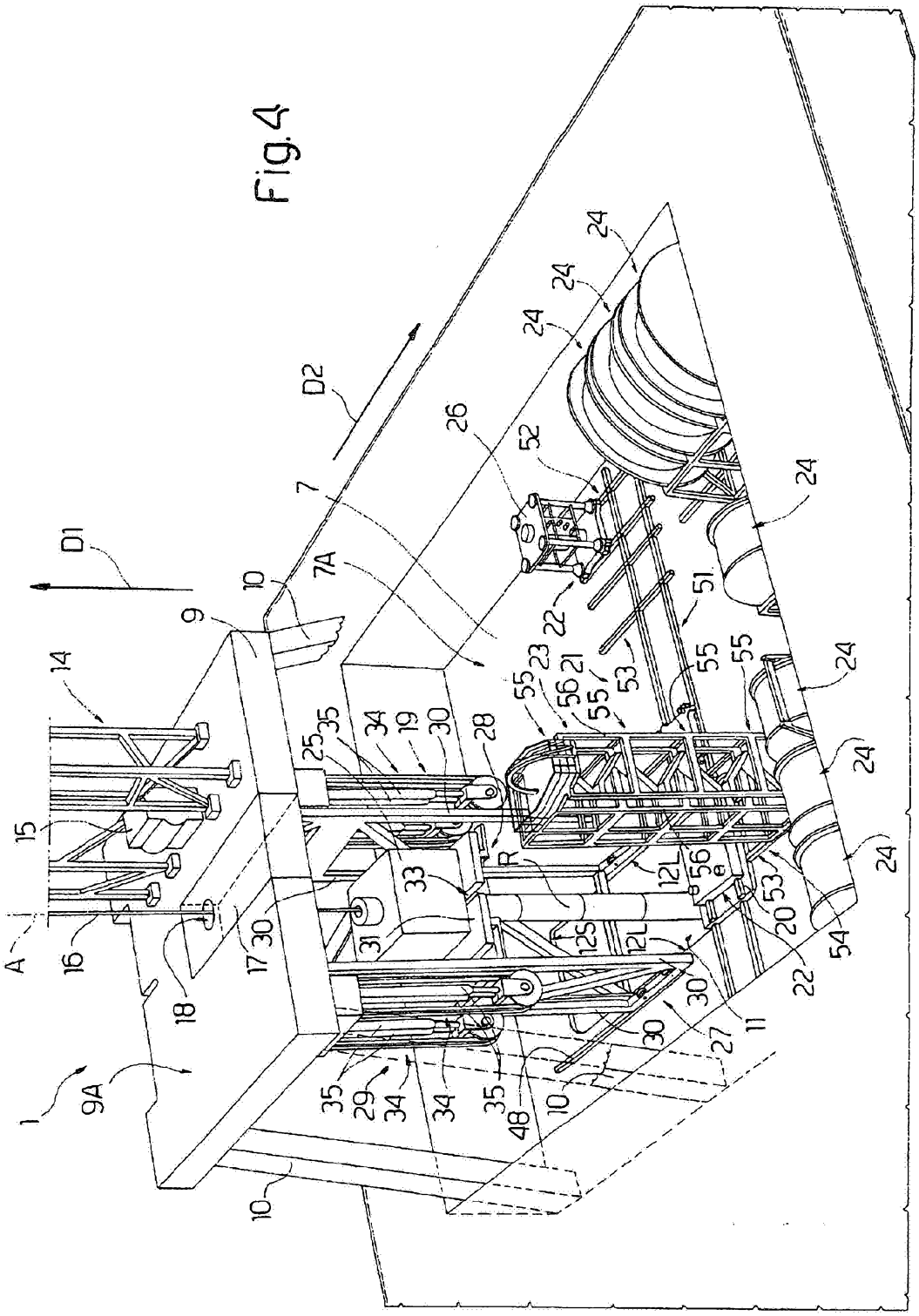
Fig.4


D1
D2
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1
9A
9
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7A
14
15
16
17
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31
25
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30
28
33
R
12L
12S
56
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20
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51
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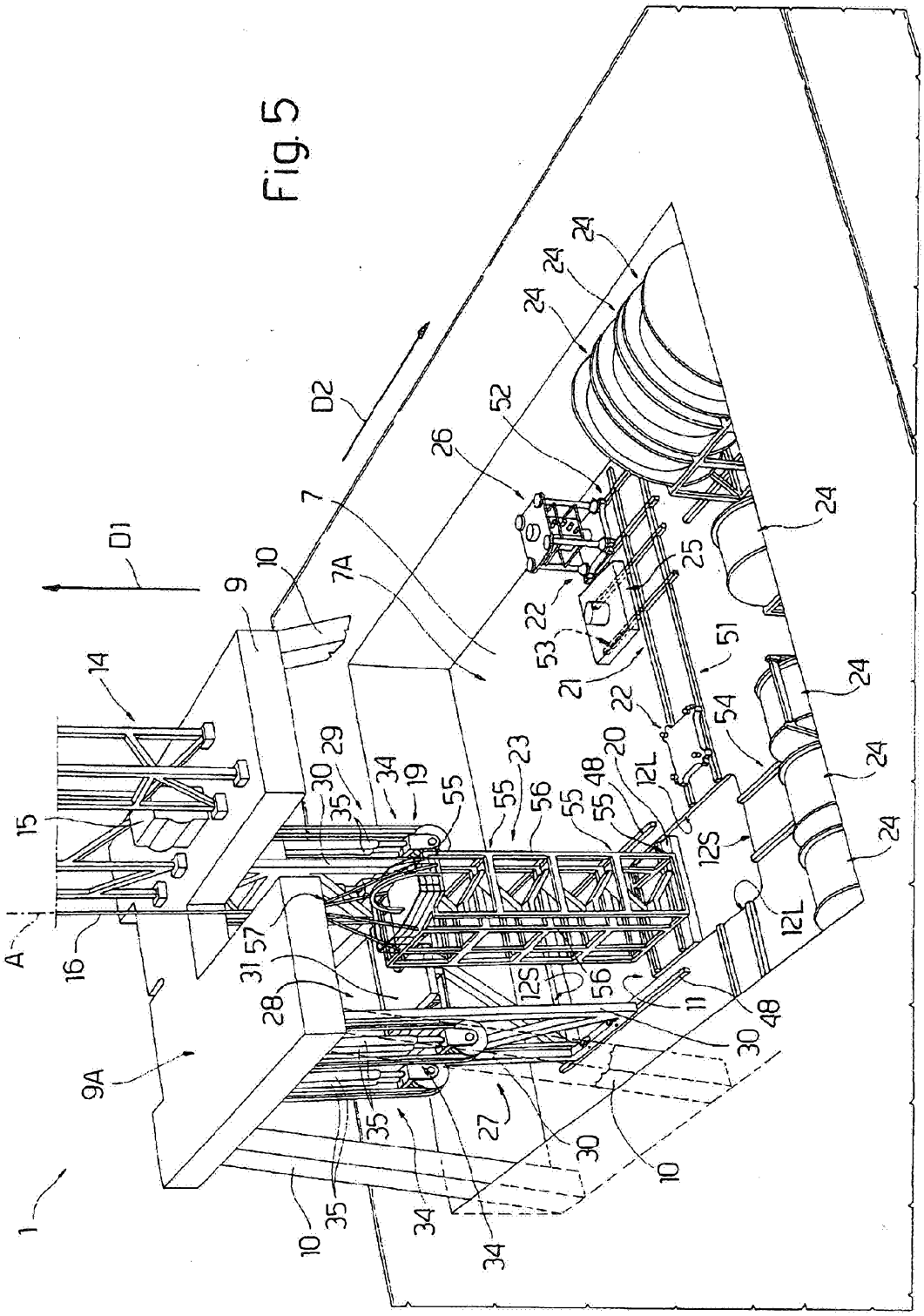
27
11
29
48

Fig. 5


D1
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