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(54) HANDLING ASSEMBLY FOR TUBULARS AND RELATED METHOD

ANORDNUNG ZUR HANDHABUNG VON ROHRLEITUNGEN UND ENTSPRECHENDES
VERFAHREN

DISPOSITIF DE MANIPULATION D'ELEMENTS TUBULAIRES ET PROCEDE ASSOCIE

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GB-A- 2 150 962 **US-A- 4 117 941**
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Description

[0001] This invention relates to a pipe or tubular handling assembly for use on a rig and to a method of supplying drilling apparatus at well center. It also relates to a derrick structure for handling and storing well tubulars on a rig floor

BACKGROUND OF THE INVENTION

[0002] In conventional rig design, well tubulars, such as drilling pipes, riser and casing tubular are usually stored as single lengths of pipe (joints) laid out on racks at the main floor or deck of the rig. Joints of well tubulars for use during a drilling operations are lifted over a structure connecting the main rig floor with the drill or rig floor, the so-called catwalk, and lowered into a opening, the mousehole, in the drill floor next to the well center. To add the joint to the drill string, the upper end of the drilling, consisting of swivel and kelly, is disconnected from the rest of the drill string, and moved over to the mousehole. The kelly is then stabbed into the upper end of the joint ("box") and rotated so as to tighten the threaded tool joint. The kelly and the joint of pipe are lifted and moved back over to well center and stabbed into the upper end of the suspended drill string. Again, the threaded connection is tightened by rotating the pipe joint and kelly.

[0003] After connecting the new joint to the drill string, drilling can resume for the length of the joint. Then the drilling has to stop to add another joint to the drill string repeating the steps described above.

[0004] At certain intervals drilling stops. At this point, the drill string is tripped out of the well. To trip out the kelly and swivel is removed from the top of the drill string and placed into another opening in the drill floor, the rat-hole. Then, drill pipe elevators are used to pull the drill string and break it into stands of pipes or riser joints. During tripping not every single joint of tubular is broken out one at a time.

Instead, the drill string is most often pulled three joints at a time. Joints of pipe connected constitute what is called a stand. Stands can vary between two and four joints. The stands are usually stored within vertical pipe rack in the mast or derrick structure. The stands are re-assembled in what is basically the reverse of the braking-out operation.

[0005] Casing tubulars are assembled as the initial drill string.

However, there is usually no tripping operation for casing. Thus there is no storage space within the derrick structure to store stands of casing.

[0006] Marine risers are run in very much the same manner as the casing string. Again as riser joints are not subject to tripping and are usually retrieved only in emergencies or when the rig is moved, there is no vertical storage provided for riser stands or joints within the mast or derrick structure of a floating drilling platform.

[0007] In recent years many attempts were made to automate at least part of the pipe handling using for example electronically controlled equipment to assemble and store pipe joints.

[0008] The above described activities occur along the path of well construction. This path is often referred to as the critical path. All of the activities occurring in the critical path contribute to "flat time", the time spent not drilling, or making hole. Therefore, the present invention can be seen as seeking to reduce the amount of flat time and so increase efficiency of well creation.

[0009] US-A-5,647,443 (Heerema Group Services B. V.) relates to a method and device for drilling for oil or gas in an underwater bed by means of a drilling rig with a drilling derrick disposed on a floating drilling platform or on an underwater bed. In this case, prior to the placing of a casing string, the placing of a riser string or the drilling of a hole, one or more parts of the aforesaid casing string, riser string or drill string are pre-assembled on the drilling rig at one or more pre-assembly points which are located at a position different from that of the drilling derrick.

[0010] According to one aspect of the present invention, there is provided a handling assembly for use on a rig, comprising one well center and at least two handling stations for receiving tubulars, and assembling them into stands, characterised in that the handling assembly further comprises transfer means for transporting assembled stands to the well center, wherein the handling stations are spaced apart from well center. Spaced apart is defined as being outside the well center area and outside the reach of the kelly.

[0011] The pre-assembly of stands of tubulars such as casings, drill pipe and risers before the individual tubulars reach the drilling apparatus reduces the amount of operations that occur at the critical path and reduces the flat time associated with drilling.

[0012] Preferably the handling stations are displaced either side of the drilling apparatus, with a storage area for vertically oriented stands being provided between each handling station and the drilling apparatus. This allows stands to be made up independently of the rate of progress of drilling and stored ready for transfer to the well hole. This allows stands of tubulars to be pre-assembled independently of the drilling operation and ensures significant reduction in the flat time along the critical path as the transfer means simply supplies a pre-assembled stand when required.

[0013] Preferably the drilling apparatus is located proximal to one edge of a rig deck with the tubulars arrayed along racks over at least the central portion of the deck. A conveyor system is provided to transport tubulars to the handling station, the conveyor system comprising lifting means such as hoists or gantry cranes, and trolleys for bearing tubulars to the handling station.

[0014] Where stands are made of lighter casings or drill pipe, the transfer means is a pipe racking system. However stands of larger tubulars such as risers, the

transfer means comprises a hoist means and a pipe handling assembly, with the hoist bearing the weight of the riser stand as it is transported to well center and the pipe racking system travelling with the hoist to provide lateral guidance of the riser stand.

[0015] Preferably each handling station comprises a mousehole with a total of three mouseholes, including that of the well center. Contrary to conventional mouseholes, at least one of the mouseholes of the new handling assembly has a diameter sufficiently large to accommodate the larger casing and/or riser diameter. The mouseholes are also deeper than conventional mouseholes. The depths of the mouseholes exceed the length of at least two pipe joints, or at least one casing, preferably three pipe joints or two casings.

[0016] The ability of the handling assembly to assemble and transport double stands of risers and triple stands of casing is of significant advantage in reducing the flat time. The equipment required to transport these stands is necessarily of a specification that will take the additional weight. Thus the additional equipment requirements of the handling assembly are costly, but the overall reduction in flat time and speed of increase of making hole or tripping out, means that greater cost efficiency is achieved overall.

[0017] In accordance with another aspect of the invention, there is provided a method of supplying drilling apparatus at well center with stands of tubulars, characterised in that the method comprises the steps of:

- 1) Conveying tubulars to a first handling station and a second handling station, the handling stations being placed on different sides of the well center;
- 2) Assembling tubulars into stands at the first handling station whilst simultaneously drilling at well center;
- 3) Transferring the assembled stands to the drilling apparatus.

[0018] The method thus allows continuous assembly of stands during drilling and substantially eliminates activities from well center that do not directly result in making hole. In this way one handling station may be assembling stands, whilst the other handling station either assembles stands simultaneously with drilling at well center or performs alternative tasks related to drilling. Thus the method may include assembling tubulars into stands at both the first and the second handling stations whilst simultaneously drilling at well center.

[0019] Alternatively the method may include moving stands from one handling station to well center, whilst the other handling station is assembling stands.

[0020] Preferably the method includes storing stands in a position between a handling station and well center, so ensuring stands are always pre-assembled for use downhole. This allows stands to be made up and stock

piled in advance of their drilling need.

[0021] These and other features of the invention, preferred embodiments and variants thereof, possible applications and advantages will become appreciated and understood by those skilled in the art from the following detailed description and drawings.

DRAWINGS

[0022]

FIG. 1 shows a perspective view of a semi-submersible rig;

FIG. 2 shows a plan view of a deck of the rig showing a handling assembly in accordance with the present invention;

FIG. 3 shows a side view of a conveyor and a pipe racking system used in the handling assembly; and

FIG. 4 to 7 show a handling station and pipe handling machine of the assembly during operation.

MODE(S) FOR CARRYING OUT THE INVENTION

[0023] In FIG. 1, a semi-submersible rig 10 incorporating a handling assembly according to the invention is shown. The rig 10 comprises a deck area 12 which is attached via four columns 14, 15 to two pontoons 16. The four columns 14, 15 and pontoons 16 are interconnected and braced by four cross bracing struts 20.

[0024] A derrick 22 is located to the rear, or aft, of the deck with a heli-pad 24 located towards the front of the deck area 12.

[0025] A plan view of the handling assembly is shown in FIG. 2. Due to removal of the prime movers to the pontoons, a large amount of deck space is available near the derrick 22. In plan view, the derrick is not visible, although a well center 30 and associated drilling apparatus 32 are shown. The handling assembly comprises two handling stations 34, 35 spaced apart on opposite sides of well center 30, two conveyors 36, 38, two pipe racking systems 40, 42 and two pipe handling machines 44, 46, and provides two paths of travel for tubulars to reach the well center 30. A storage area is provided between each handling station and the drilling apparatus. As the activities along each of the two paths are the same, the activities and components of the handling assembly will only be described with reference to one path, namely the path including conveyor 36, handling station 34, and pipe handling machine 44. The pipe racking system 40, 42 is common to both paths.

[0026] Prior to running of the handling assembly, the tubulars, i.e. riser, drill pipe, drill collar and casing, are stored on deck in racks positioned towards the center

of the deck. The riser is positioned at section 50, with different diameter casings provided at sections 52. The casing diameter varies from 30 inches (0.76m) to 5½ inches (0.14m). Drill pipe is shown at section 54, together with drill collar 56.

[0027] For the first travel path, the pipe racking system comprises two pipe rack handling machines 40, 42, both of which are used to transport tubulars from their storage racks 60, 62 to the conveyor 36. As shown in FIG. 3, the two machines are of different configurations to handle the different weights of different types of tubulars. The first rack handling machine 40 is formed from an overhead pipe crane with laterally movable fingers 64, 66 which can be inserted into the ends of a riser 68. To lift a section of riser with this machine, the fingers 64, 66 are descended to the riser, extended laterally to insert into the central aperture of the riser 68 and to hold it, the crane then lifts to remove the riser from its storage rack 60 and travels along rails 70 to reach a trolley on rails 74, whereupon the crane lowers the fingers 64, 66, and thus the riser, and retracts the fingers 64, 66, once the riser is deposited on the trolley.

[0028] For the lighter casing and drill pipe, a second pipe rack handling machine 42, such as a Pipe Mite™ is used. This machine 42 has a moveable arm 70 which grabs and lifts sections of drill pipe or casing shown in rack 62 and deposits them onto trolleys on the conveyor 36. The machine 42 is movable along rail 72 and use of this machine avoids the need for a second overhead crane.

[0029] The conveyor 36 transports the tubulars such as riser, casing and drill pipe, to the handling station 34, and comprises guide rails 74 bearing trolleys and a scissor raiser 76 at the end of the rails 74 closest to the handling station. The rails 74 follow a flat path along the deck area, with the scissor raiser 76 being provided to raise each trolley to the height of drilling platform height, as typically the platform 80 bearing the derrick is raised above the deck portion bearing the rails 74.

[0030] The handling station 34 is provided with a hoist 82 for lifting tubulars from a conveyor trolley 84, a false mousehole 86 leading down into the column below, a double roughneck 90 and a turning table for the roughneck. The double roughneck 90 includes two pairs of tongs of different diameters so that it can join different sizes of tubulars. However as an obvious alternative, two separate roughnecks with different diameter tongs may be provided. In FIG. 2, the pipe handling machine 44 is shown at the handling station 86, although it moves between the handling station 86 and the well center 30 along rail 92, as later described. The pipe handling machine 44 has three angled extendible arms 94, 96 and 98 for improved weight lifting and safety characteristics.

[0031] The handling station 34 and pipe handling machine 44 assemble stands of tubulars i.e. two or more joined sections of tubular, from tubulars supplied along the conveyor. Once stands are assembled, they are stored in storage areas 100, 102 ready for supply to well

center 30 when required. The storage areas 100, 102, 104, 106 are provided with two racks, a high rack for stands of riser and a low rack for stands of casing and piping. The high rack has movable fingers which are extended to support stands of risers, but yet withdraw to allow access to the lower rack when storage of stands of casing and stands of drill pipe is required. Which stands are stored at the storage areas 100, 102, 104, 106 will depend on the depth of well drilled, with early in drilling the storage areas being occupied by stands of risers, at the middle of drilling by stands of different diameter casings and towards the end of drilling with stands of drill pipe.

[0032] The use of the handling assembly to produce stands of risers, casings and drill pipe will now be described with reference to the path of travel including conveyor 36, handling station 34, pipe racking system 40, 42, and pipe handling machine 44.

[0033] Firstly individual sections of tubulars such as risers, casings or drill pipe are conveyed from storage areas 50, 52, 54 and 56 to trolleys on the guide rails 74 by use of the pipe racking machines 40, 42 as described above and as shown in FIG. 3. One or more tubulars are placed onto each trolley and when the trolley has the required number of tubulars placed on it, it travels along guide rails 74 and onto scissor raiser 76. The scissor raiser 76 then raises as shown in FIG. 4, and lifts the trolley 84 to the level of the drill platform 80 bearing the derrick and thus to the same level as the handling station 34.

[0034] At the handling station 34, the tubulars are assembled into stands, and these stands are transferred by means of the pipe handling machine, and where appropriate in combination with a hoist on the derrick, to storage areas 100, 102.

[0035] Once the trolley 84 is raised, the auxiliary hoist 82 is lowered and its latching mechanism grabs the tubular 110 as shown in FIG. 5. The hoist 82 is raised and the tubular 110 is lifted from horizontal to vertical, and suspended with sufficient working height using an appropriate stop arrangement. The pipe handling machine 44 extends its lower arm 94 to grasp and support the suspended tubular 110 and the hoist 82 releases its grip on the tubular 110. The pipe handling machine 44 lifts up the tubular 110 and pivots about turntable 112 to place the tubular 110 into the mousehole and to lower it until it is clamped by the mousehole 86. This step is then repeated with another piece of tubular 114. As shown in FIG. 6, as the second tubular 114 is fed onto the top of the first tubular 110, the roughneck 90 travels along rails to reach the mousehole 86 and uses its tongs to connect the two pieces of tubular together. The roughneck 90 has two pairs of tongs of varying diameter to cope with different diameters of casing or piping.

[0036] When assembling a stand of casing, this operation is repeated until three sections of casing are assembled into a triple stand by the roughneck 90. When assembling drill pipe into a stand, the operation is re-

peated until either three sections of drill pipe are assembled into a triple stand or until four sections of drill pipe are joined together into a fourble stand by the roughneck **90**. Where a riser is assembled into a stand, this is only a double stand consisting of two sections of riser. When connecting the two risers together, manual connection is required, as the roughneck **90** is not capable of making this connection.

[0037] Once a stand of piping or casing is assembled, the pipe handling machine **44** pivots and extends its three arms **94, 96, 98** to grasp the stand and to raise it from the mousehole **86**. The arms **94, 96, 98** are then brought in towards the central axis of the handling machine **44** and it pivots about turntable **112** to then transport the stand along rails **92**. The stand can either be delivered directly to well center **30** or typically will be placed in storage areas **100, 102** ready for use when required.

[0038] Where a stand of riser **116** is in the mousehole **86**, the stand of riser **116** is lifted out of the mousehole **86** by a hoist **120** from a bridge crane up in the derrick as the pipe handling machine **44** cannot carry the weight of a stand of riser. The lower part of the derrick hoist **120** can be seen in FIG. 7. Once the double riser stand **116** is removed from the mousehole **86**, the hoist **120** and the pipe handling machine **44** move in tandem along the direction of rail **92**, the pipe handling machine **44** acting to provide lateral guidance of the stand **116**, although support of the weight of the stand is provided by the hoist **120**. As before the stand can either be delivered directly to well center **30** or placed in storage areas **100, 102** ready for use.

[0039] Near well center **30**, the drilling apparatus **32** required to make hole, comprising a travelling system, roughnecks and associated turntable are shown. Drill pipe stands **120, 122** are provided either side of well center **30** with differently configured bottom hole assemblies **124, 126** (BHA) also provided. Blow out preventers (BOPS) are also stored nearby.

[0040] When new riser, piping or casing is required for insertion into the well hole **30**, the pipe handling machine **44**, or pipe handling machine **44** and derrick hoist **120** where stands of riser are being moved, picks up the stands from storage areas **100, 102** and moves along rail **92** until a position adjacent well center **30** is reached. The travelling system comprising a travelling block and power swivel is then raised from the drill hole **30** and the stand of pipe placed in the well center **30** using a combination of drawworks, drilling line, crown sheaves and travelling block assembly configured in a multi-part block and tackle arrangement.

[0041] The pipe handling machine **44** or hoist **120** is removed from well center **30** and the travelling system is then lowered to engage with the upper end of the stand and the drilling operation is continued. The machine **44** and hoist **120** are able to retrieve or place stands in any of the storage areas near the derrick independently of well operation as the pipe handling cen-

terline is offset sufficiently from the well centerline. When stands are retrieved from the well center, they are returned to the setback areas by the pipe handling machine, or hoist as appropriate.

[0042] Stands of tubulars can be broken down and laid out of the derrick by reversing the process described above.

[0043] The handling assembly substantially eliminates activities from the well construction critical path that do not directly result in making hole, i.e. picking up or laying down pipe, and generally integrates drilling processes, thus providing at least a 50%+ reduction in tubular handling time, by enabling pipe, casing, riser etc., to be assembled in stands off the critical path. Logging toolstrings, core barrells etc can also be stored as stands (fourbles, triples, or doubles) as required. This results in a significant reduction in "flat time", the time spent not making hole. The reduction, some 25%, is readily quantifiable, and is due to gains in mechanical efficiency resulting from removing activities from the critical path altogether, or significantly reducing their impact by increasing the number of parallel activities, as the configuration of all machines in the assembly enables concurrent operations of any or all machines in the assembly.

[0044] The handling assembly thus allows stands of tubulars, such as stands of risers, stands of casing and stands of drill pipe, to be made by both handling stations whilst the wellbore is being drilled, and for the stands to be directly transported to well center, whilst one or both of the handling stations are making stands. Thus making of stands can be simultaneous at both handling stations with drilling, or making of stands can be simultaneous with drilling at one handling station if the other handling station is required to perform other tasks during making hole.

[0045] On the rig, subsea and completion facilities include dedicated rectangular storage areas adjacent the port and starboard sides of the substructure for locating tree running, subsea equipment, and well testing equipment. Additionally the BOP and riser are hung off moon-pool beams and moved away from well center **30** which allows the BOP to remain deployed, while open water work is performed over the well. This feature also enables the BOP to remain deployed during short infield moves, saving the run/retrieval time for the BOP.

[0046] The following example describes a typical deep water-drilling programme:

[0047] While surface hole is drilled, the conductor casing, and 26" (0.66m) BHA are made up in either of the handling stations, ready to run.

[0048] Once the conductor is set, the 26" (0.66m) hole section is drilled using the pre-assembled 26 BHA, while racking back 20" (0.5m) casing, 17½" (0.44m) BHA's, and riser. Additionally 17½" (0.44m) hole section mud is prepared.

[0049] After setting 20" (0.5m) casing, the BOP is run using the double stands of riser at rates in excess of 520

fph (158.5 mph). This means for example that in a water depth of 7500 ft (2286m) the BOP can be run in approximately 14 hours compared with up to 62 hours for a conventional rig. While the BOP is tested, and the section is drilled, the 13 3/8" (0.34m) casing is picked up and racked in the derrick. The 36" (0.91 m) and 26" (0.66m) BHAs are laid down and the 12 1/4" (0.31m) hole section mud is prepared.

[0050] While the 12 1/4" (0.31m) hole section is drilled using the pre-tested BHA's, the 9 5/8" (0.24m) casing is picked up and racked in the derrick along with any logging tools that may be required for the section. Also, the 8 1/2" (0.21m) hole selection mud is prepared. Additionally if a tree is to be run, it can be prepared in a dedicated transport and storage area.

[0051] While the 8 1/2" (0.21m) hole section is drilled, the 7" (0.18m) liner and test string for completion are racked in the derrick. Additionally, if required a completion riser may also be racked back. If the well is to be tested, either the permanently installed or temporary test equipment is prepared. Once the liner is set, the well can either be tested, or if it is to be completed, the completion run, the BOP recovered and the tree run.

[0052] In a further embodiment of a handling assembly in accordance with the invention, two pipe rack handling machines are provided, and instead of the earlier scissor raiser, a ramp is provided in combination with rails. In this embodiment, one pipe rack handling machine is the same as that shown by reference numeral 40 in FIG. 2.

The second pipe rack handling machine is similarly configured, but is adapted to handle less heavy tubulars, such as lighter casing and drill pipe. Thus as for machine 40, the second machine is an overhead crane with laterally movable fingers which hold and lift sections of drill pipe or casing shown in rack 62 in the same manner as machine 40 as previously mentioned, lifts the riser.

[0053] As sections of tubular are lifted by the pipe handling machines, the cranes move along rails to deposit the tubulars onto trolleys which are movable along rails. The rails follow a flat path along the deck area, with the ramp being provided to raise the trolleys to the height of the drilling platform.

[0054] Once the trolley is on the ramp and the front end of the trolley has reached the top end of the ramp, the auxiliary hoist 82 is lowered and its latching mechanism grabs the tubular largely as previously discussed in relation to FIGs. 4 to 7.

Claims

1. A handling assembly for use on a rig (10), comprising one well center (30) and at least two handling stations (34, 35) for storing tubulars and assembling them into stands, **characterised in that** the handling assembly further comprises transfer means (44, 120, 92) for transporting assembled stands to

the well center, wherein the handling stations are spaced apart from well center.

2. A handling assembly according to claim 1, wherein the handling stations are displaced either side of the well center, with a storage area (100, 102) for vertically oriented stands being provided between each handling station and the drilling apparatus.

3. A handling assembly according to claim 1, having at least one mousehole (86) associated with each of the handling stations and the well center.

4. A handling assembly according to claim 1, having at least one mousehole (86) associated with at least one of the handling stations, wherein the diameter of the mousehole is sufficient for the assembly of casing stands.

5. A handling assembly according to claim 1, having a racking system (40, 42) for drill pipe stands, casing stands and riser stands.

6. A handling assembly according to claim 1, wherein a conveyor system (36) is provided to transport tubulars to the handling station, the conveyor system comprising lifting means (82) and trolleys (84) for bearing tubulars to the handling station.

7. A handling assembly according to claim 1, wherein the transfer means comprises a hoist means (82) and a pipe handling assembly (44), with the hoist means bearing the weight of a riser stand as it is transported to well center and the pipe racking system travelling with the hoist means to provide lateral guidance of the riser stand.

8. A method of supplying drilling apparatus at well center with stands of tubulars through a handling assembly according to claim 1, **characterised in that** the method comprises the steps of:

1) Conveying tubulars to a first handling station (34, 35) and a second handling station (34, 35), the handling stations being placed on different sides of the well center (30);

2) Assembling tubulars into stands at the first handling station whilst simultaneously drilling at well center;

3) Transferring the assembled stands to the drilling apparatus.

9. A method of supplying drilling apparatus according to claim 8, wherein the first handling station assembles stands simultaneously with drilling at well center, whilst the second handling station performs tasks related to drilling.

10. A method of supplying drilling apparatus according to claim 9, including moving stands from one handling station to well center, whilst the other handling station is assembling stands.
11. A method of supplying drilling apparatus according to claim 8, including assembling tubulars into stands at both the first and the second handling stations whilst simultaneously drilling at well center.
12. A method of supplying drilling apparatus according to claim 8, in which after assembly of the tubulars into stands, the stands are stored in a position between a handling station and well center.

Revendications

1. Assemblage de manutention pour utilisation sur un appareil de forage (10), comprenant un centre de puits (30) et au moins deux stations de manutention (34,35) pour l'entreposage de tubes et leur montage sous la forme de tiges, **caractérisé en ce que** l'assemblage de manutention comprend de plus des moyens de transfert (44,120,92) pour transporter les tiges assemblées vers le centre du puits, dans lequel les stations de manutention sont disposées de part et d'autre du centre du puits.
2. Assemblage de manutention selon la revendication 1, dans lequel les stations de manutention sont déplacées de chaque côté du centre du puits, avec une zone de stockage (100,102) pour orienter verticalement les tiges étant fournies entre chaque station de manutention et l'appareil de forage.
3. Assemblage de manutention selon la revendication 1, ayant au moins un trou de souris (86) associé avec chacune des stations de manutention et le centre du puits.
4. Assemblage de manutention selon la revendication 1, ayant au moins un trou de souris (86) associé avec au moins une des stations de manutention, dans lequel le diamètre du trou de souris est suffisant pour le montage du cuvelage des tiges.
5. Assemblage de manutention selon la revendication 1, ayant un dispositif de gerbage (40,42) pour les tiges de tubes de forage, le cuvelage de tiges et de colonnes de tiges.
6. Assemblage de manutention selon la revendication 1, dans lequel un dispositif de convoyage (36) est fourni pour transporter les tubes vers la station de manutention, le dispositif de convoyage étant constitué de moyens de levage (82) et de chariots (84) pour porter les tubes jusqu'à la station de manutention.

tion.

7. Assemblage de manutention selon la revendication 1, dans lequel les moyens de transfert comprennent des moyens de levage (82) et un assemblage de manutention de tubes (44), les moyens de levage portant le poids d'une colonne de tiges quand elle est transportée vers le centre du puits et le dispositif de gerbage des tubes circulant avec les moyens de levage pour fournir un guidage latéral de la colonne de tiges.
8. Procédé pour fournir un appareil de forage au centre d'un puits avec des tiges de tubes à travers un assemblage de manutention selon la revendication 1, **caractérisé en ce que** le procédé est constitué des étapes de :

- 1) Convoyage des tubes vers une première station de manutention (34,35) et une deuxième station de manutention (34,35), les stations de manutention étant placées sur différents côtés du centre du puits (30) ;
- 2) Assemblage des tubes en tiges à la première station de manutention tout en forant simultanément au centre du puits ;
- 3) Transfert des tiges assemblées vers l'appareil de forage.

9. Procédé pour fournir un appareil de forage selon la revendication 8, dans lequel la première station de manutention assemble les tiges simultanément avec le forage au centre du puits, pendant que la deuxième station de manutention réalise les tâches en rapport avec le forage.
10. Procédé pour fournir un appareil de forage selon la revendication 9, comprenant le déplacement des tiges depuis l'une des stations de manutention vers le centre du puits, pendant que l'autre station de manutention assemble les tiges.
11. Procédé pour fournir un appareil de forage selon la revendication 8, comprenant un assemblage de tubes en tiges à la fois à la première et à la deuxième station d'assemblage pendant le forage simultané au centre du puits.

12. Procédé pour fournir un appareil de forage selon la revendication 8, dans lequel après l'assemblage des tubes en tiges, on stocke les tiges dans une position entre une station d'assemblage et le centre du puits.

Patentansprüche

1. Handhabungsanordnung zur Verwendung auf einer

Bohrinsel (10), umfassend ein Quellenzentrum (30) und zumindest zwei Handhabungsstationen (34, 35) zur Lagerung von Rohren und ihrer Anordnung in Ständern, **dadurch gekennzeichnet, daß** die Handhabungsanordnung weiterhin Übertragungseinrichtungen (44, 120, 92) zum Transport der angeordneten Ständer zu dem Quellenzentrum umfaßt, wobei die Handhabungsstationen von dem Quellenzentrum einen Abstand aufweisen.

2. Eine Handhabungsanordnung nach Anspruch 1, wobei die Handhabungsstationen auf beiden Seiten des Quellenzentrums angeordnet sind, mit einem Lagerbereich (100, 102) für vertikal ausgerichtete Ständer, die zwischen jeder Handhabungsstation und dem Bohrgerät vorgesehen sind.

3. Eine Handhabungsanordnung nach Anspruch 1, die zumindest ein Mausloch (86) zugehörig zu jeder Handhabungsstation und dem Quellenzentrum aufweist.

4. Eine Handhabungsanordnung nach Anspruch 1, die zumindest ein Mausloch (86) verknüpft mit zumindest einem der Handhabungsstationen aufweist, wobei der Durchmesser des Mausloches ausreichend für die Anordnung von Gehäuseständern ist.

5. Eine Handhabungsanordnung nach Anspruch 1, mit einem Regalsystem (40, 42) für Bohrrohrständer, Gehäuseständer und Steigrohrständer.

6. Eine Handhabungsanordnung nach Anspruch 1, wobei ein Fördersystem (36) vorgesehen ist, um Rohre zu der Handhabungsstation zu transportieren, wobei das Fördersystem Hebeeinrichtungen (82) und Transportwagen (84) zum Tragen von Rohren zu der Handhabungsstation aufweist.

7. Eine Handhabungsanordnung nach Anspruch 1, wobei die Übertragungseinrichtungen eine Hebeeinrichtung (82) und eine Rohrhandhabungsanordnung (44) umfaßt, wobei die Hebeeinrichtung das Gewicht eines Steigrohrständers trägt, während er zu dem Quellenzentrum transportiert wird, und das Rohrlagersystem mit der Hebeeinrichtung wandert, um eine seitliche Führung des Steigrohrständers zu liefern.

8. Ein Verfahren zur Lieferung eines Bohrgeräts am Quellenzentrum mit Ständern von Rohren mittels einer Handhabungsanordnung nach Anspruch 1, **dadurch gekennzeichnet, daß** das Verfahren folgende Schritte aufweist:

1) Fördern der Rohre zu einer ersten Handhabungsstation (34, 35) und einer zweiten Hand-

habungsstation (34, 35), wobei die Handhabungsstationen an unterschiedlichen Seiten des Quellenzentrums (30) angeordnet sind;

2) Anordnen von Rohren in Ständern an der ersten Handhabungsstation während gleichzeitigen Bohrens am Quellenzentrum;

3) Übertragen der angeordneten Ständer zu dem Bohrgerät.

9. Ein Verfahren zur Lieferung eines Bohrgeräts gemäß Anspruch 8, wobei die erste Handhabungsstation die Ständer gleichzeitig mit dem Bohren am Quellenzentrum anordnet, während die zweite Handhabungsstation Aufgaben durchführt, die dem Bohren zugeordnet sind.

10. Ein Verfahren zur Lieferung eines Bohrgeräts nach Anspruch 9, einschließlich Bewegen der Ständer von einer Handhabungsstation zu dem Quellenzentrum, während die andere Handhabungsstation Ständer anordnet.

11. Ein Verfahren zur Lieferung eines Bohrgeräts nach Anspruch 8, einschließlich Anordnen von Rohren in Ständer an sowohl der ersten wie auch der zweiten Handhabungsstation während gleichzeitig am Quellenzentrum gebohrt wird.

12. Ein Verfahren zur Lieferung eines Bohrgeräts nach Anspruch 8, bei dem nach der Anordnung der Rohre in Ständern die Ständer in einer Position zwischen einer Handhabungsstation und einem Quellenzentrum gelagert werden.

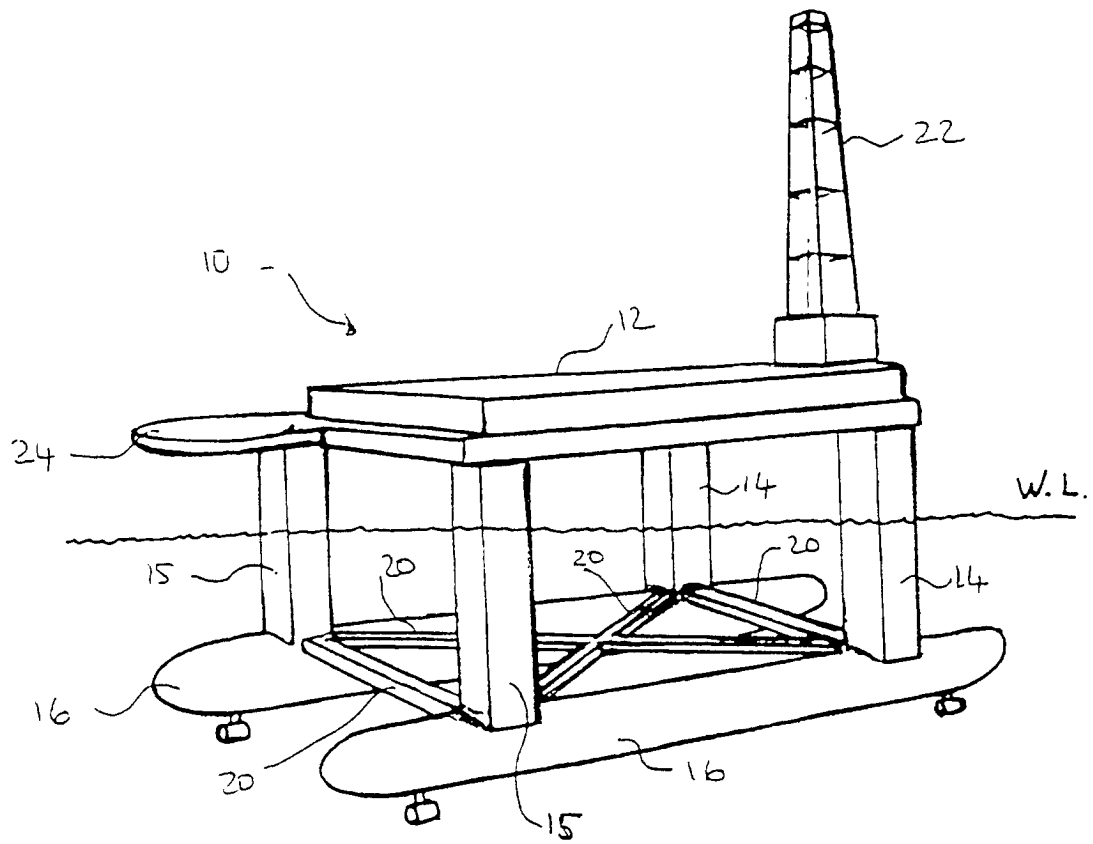


Figure 1

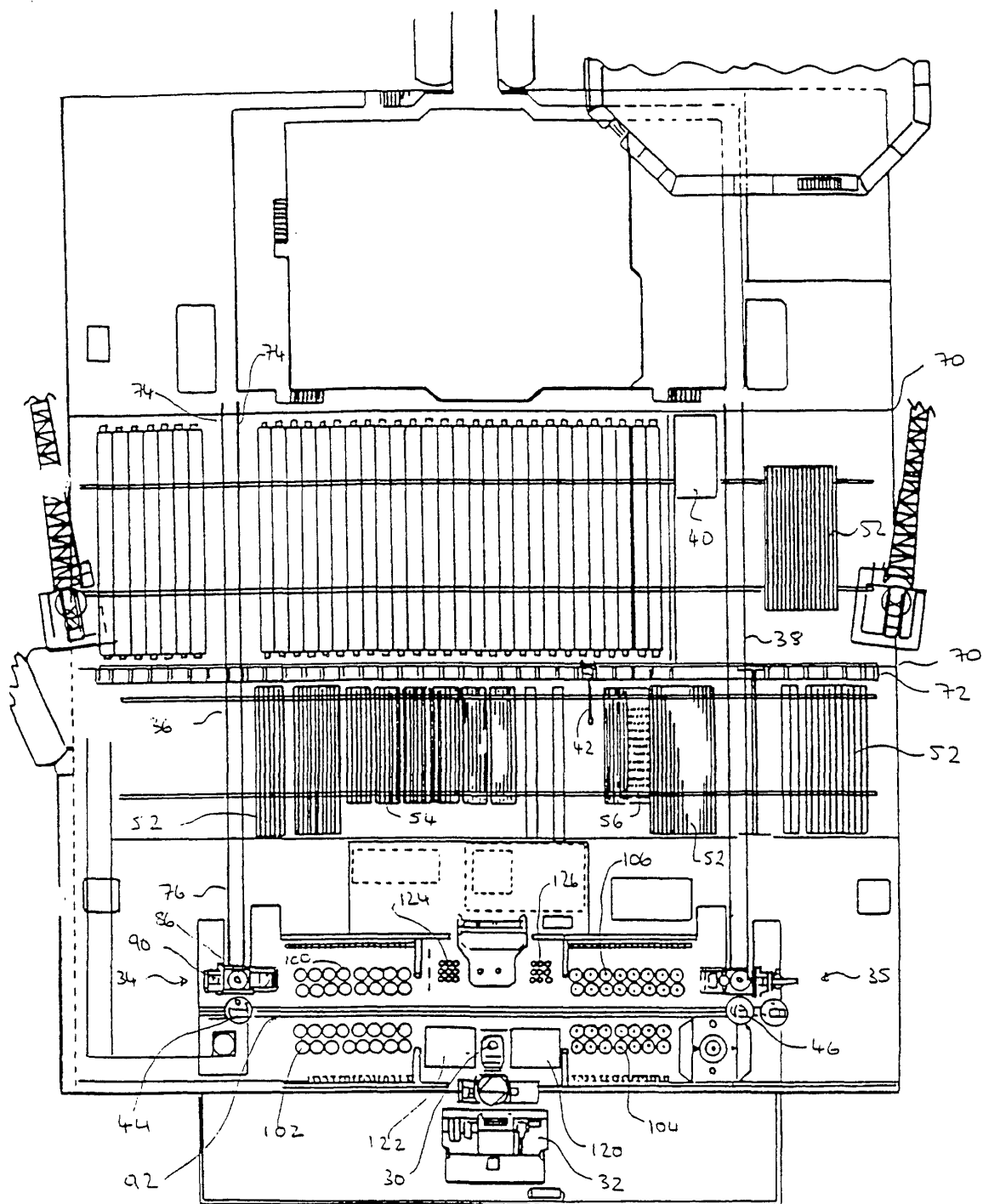


Figure 2

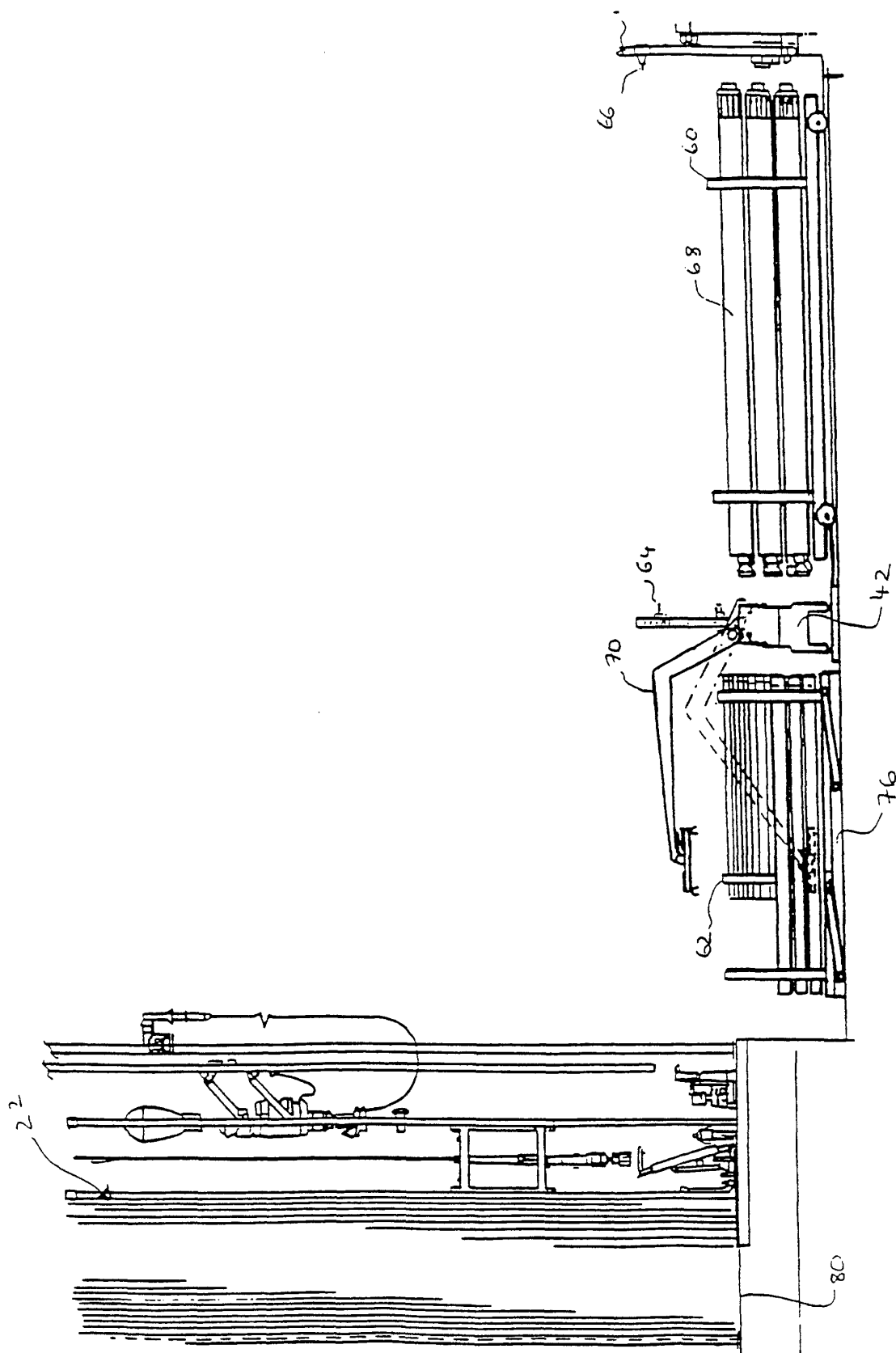


Figure 3

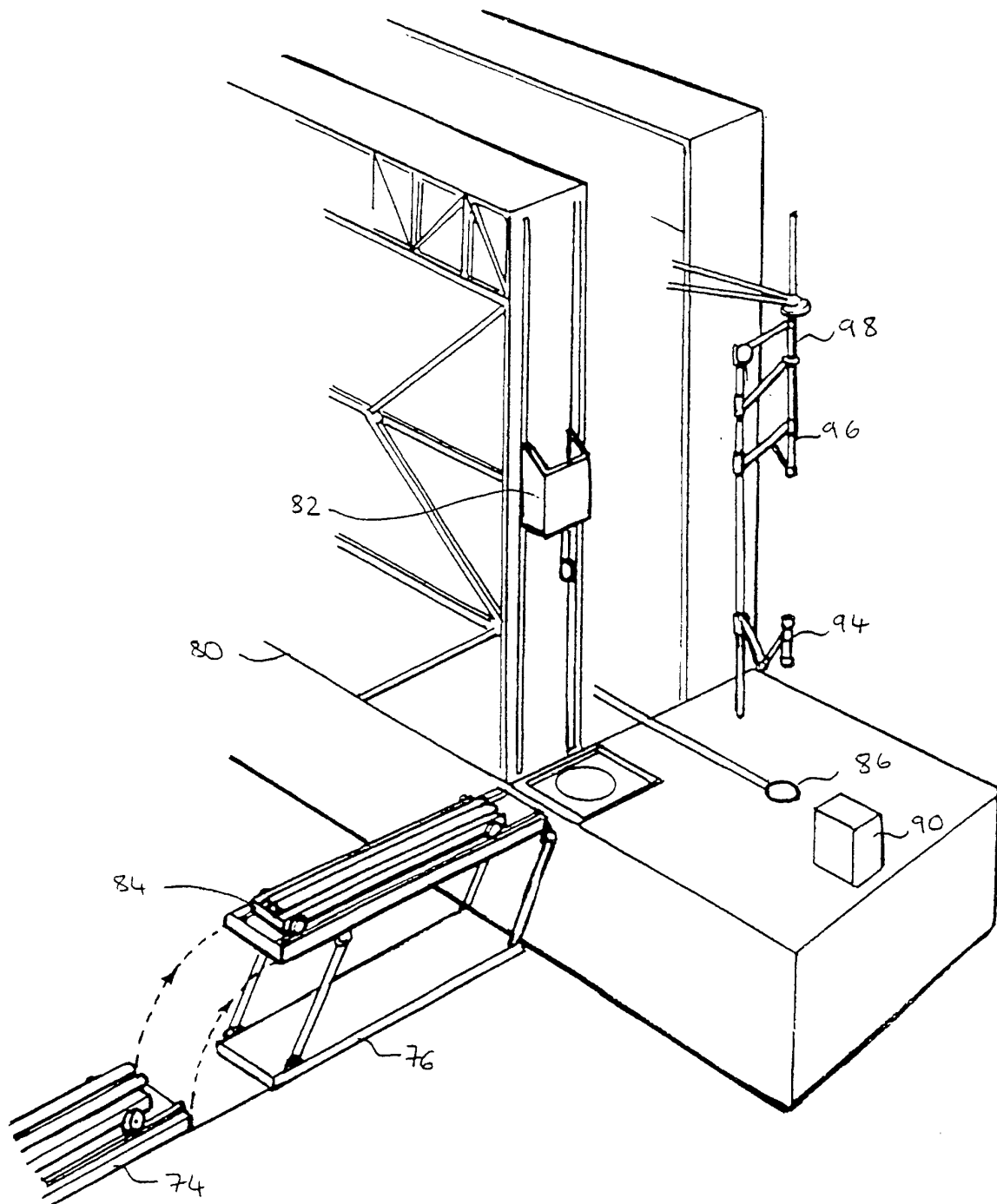


Figure 4

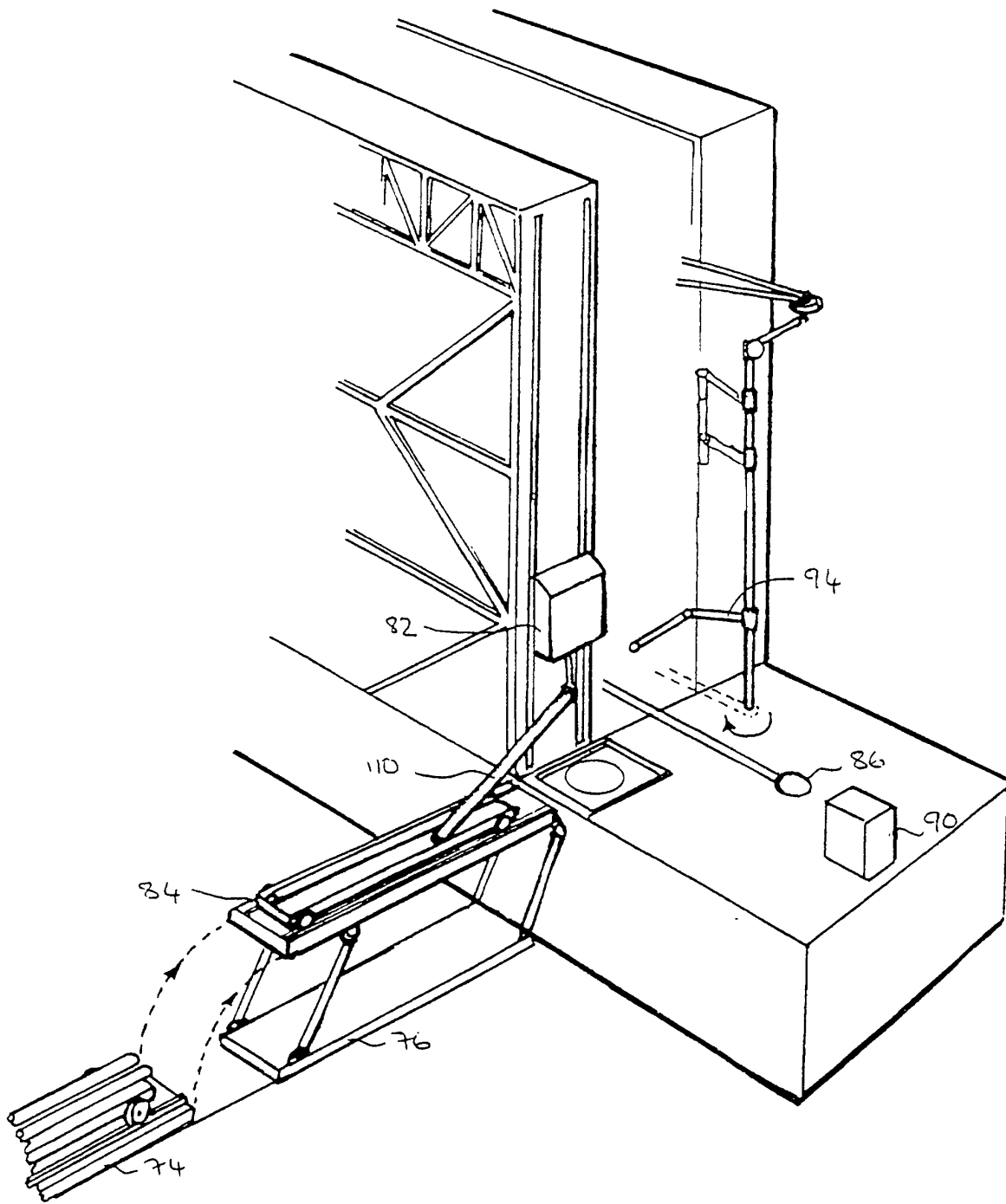


Figure 5

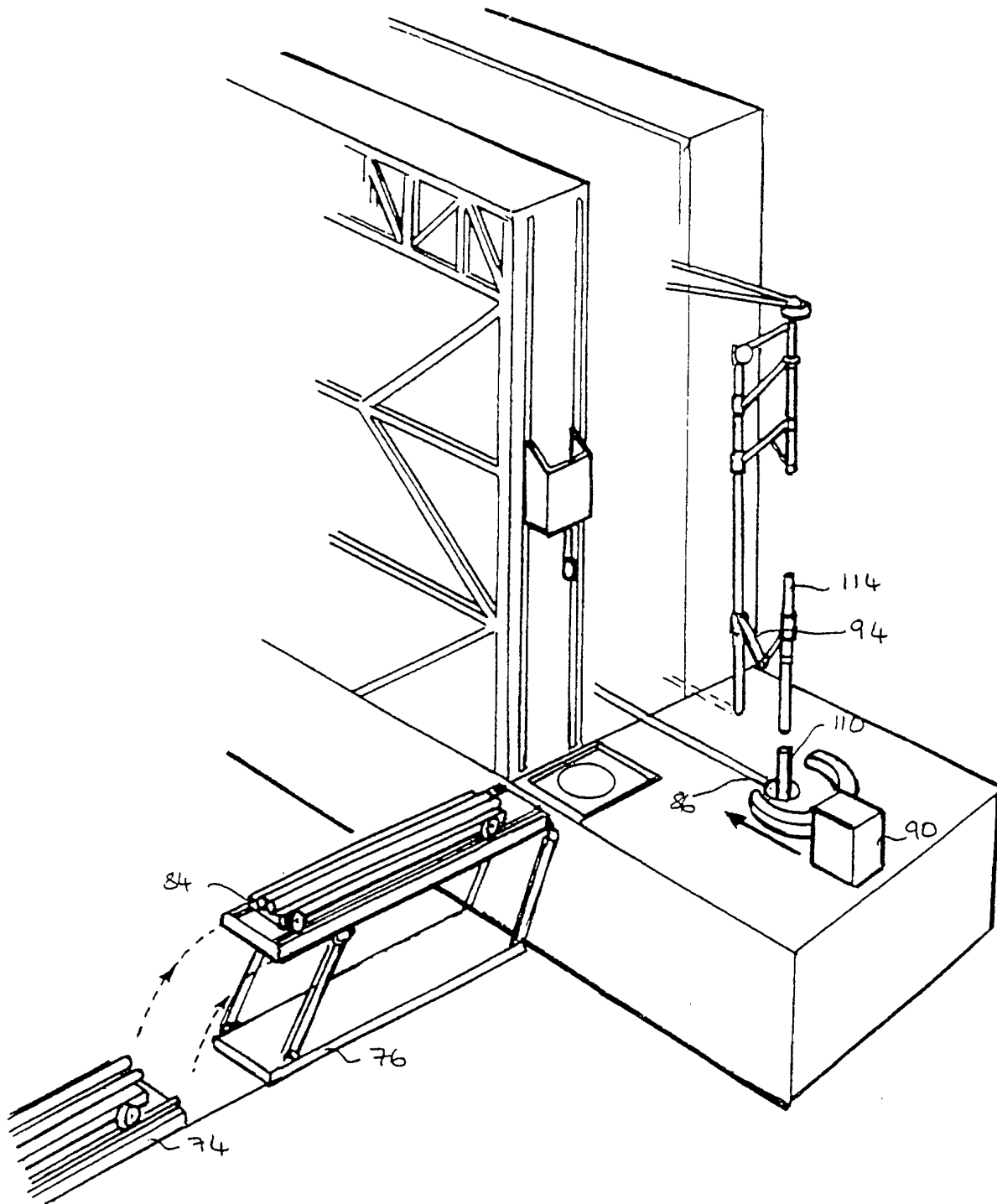


Figure 6

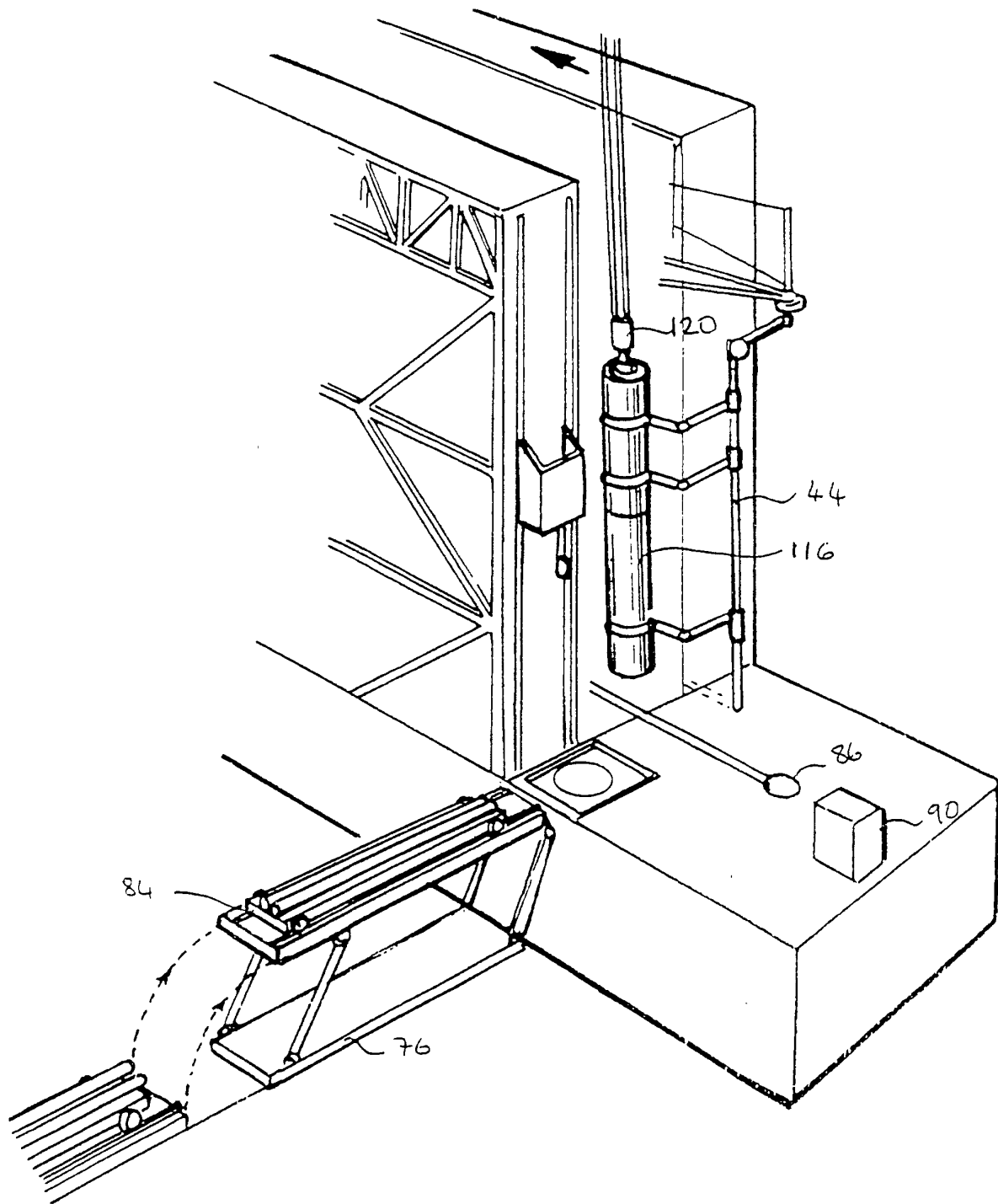


Figure 7