

[54] **PIPE RACKING SYSTEM**

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[51] **Int. Cl.** **E21b 19/14**

[58] **Field of Search** **214/2.5, 1 P, 15 R; 175/85; 212/3, 13, 14, 15, 18, 20, 22, 129, 133**

[56] **References Cited**

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[57]

ABSTRACT

In offshore drilling barge, pipe racks are disposed to either side of a central skidway and extend to sides of the barge. Derricks or cranes are located on opposing barge sides for carrying pipe from a loading vessel to the pipe racks. Straddling each of the pipe racks are guide rails on which a bridge crane is mounted. The bridge crane carries spaced apart pipe coupling means for engaging or coupling the pipes at their respective ends, whereby the crane means may be used to lift and move pipes vertically and horizontally relative to the pipe rack independently of the derrick means.

10 Claims, 5 Drawing Figures

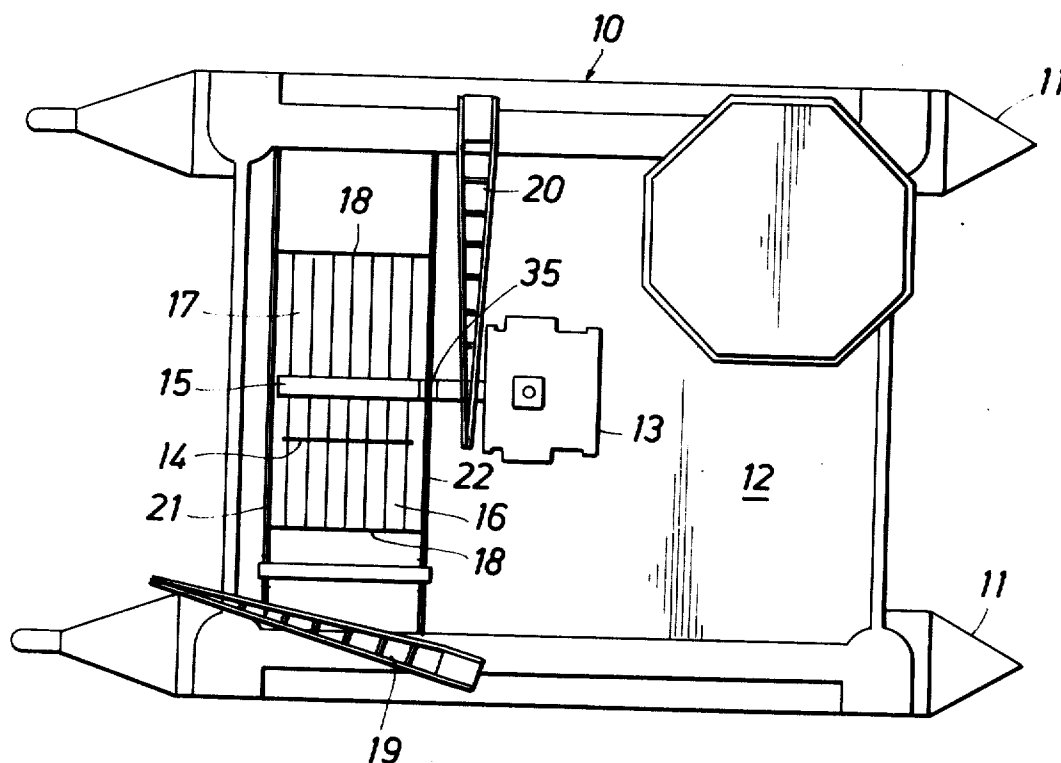


FIG. 1

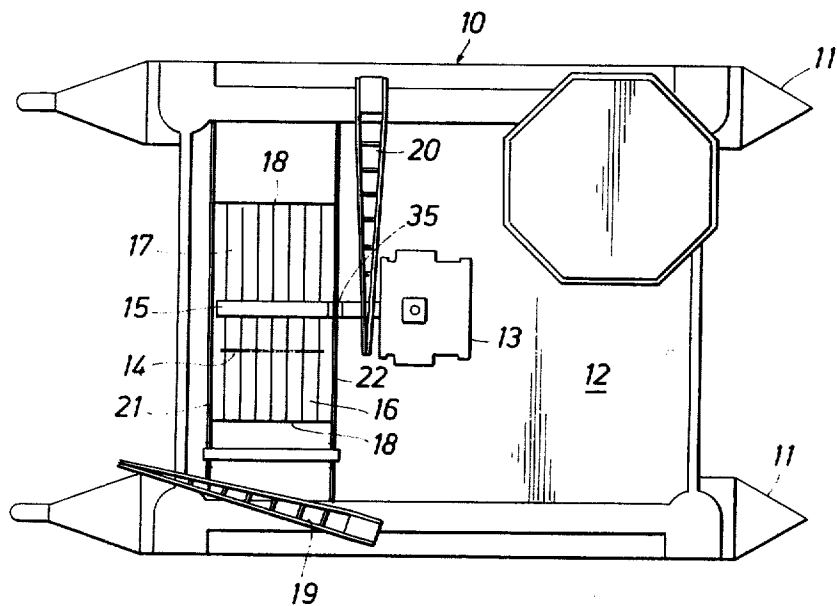


FIG. 2

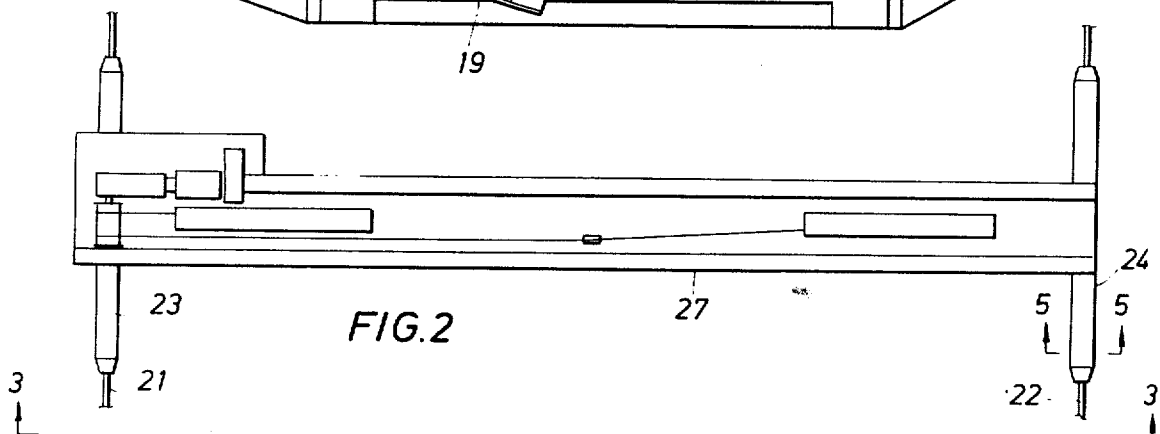


FIG. 3

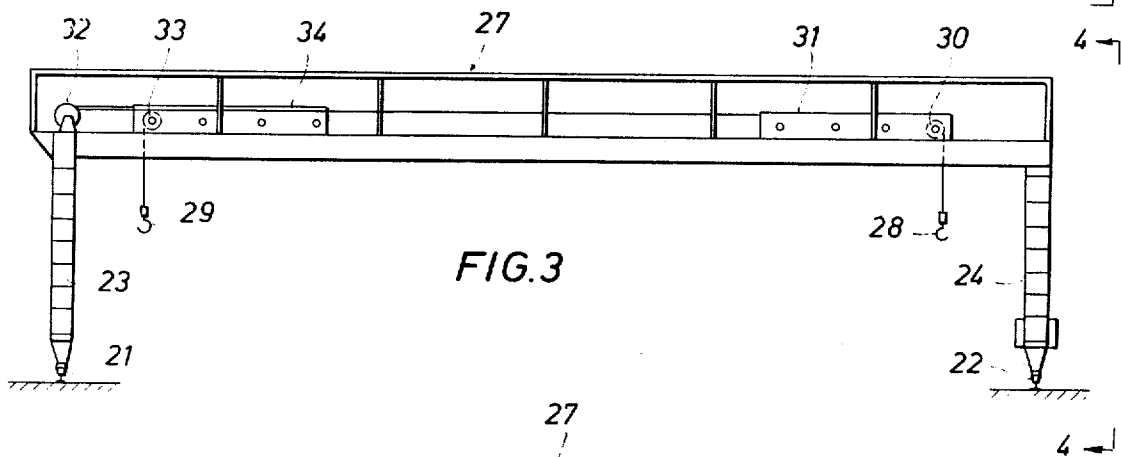


FIG. 5

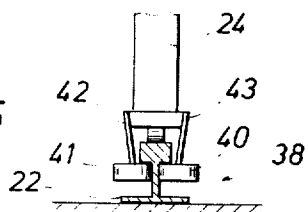
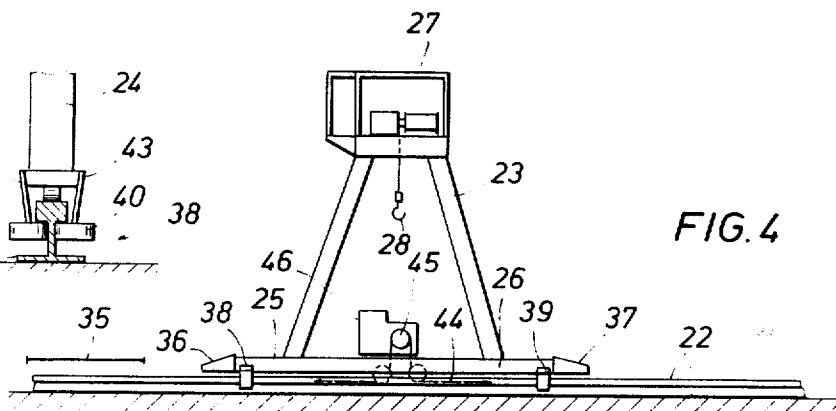


FIG. 4



PIPE RACKING SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to offshore platforms, and more particularly, to offshore platforms employing means for handling pipe relative to a pipe rack system on the platform and relative to a supporting vessel.

Drill pipe, casing and other tubular goods, which are used in a drilling operation, are in sections or lengths which are coupled endwise to one another in the drilling tower to form a depending lengthwise-extending tubular string. A drilling string carries a drilling bit for drilling into formations disposed below said tower. From time to time, the drilling string is removed from the borehole to change the bit. When the drilling string is removed, the pipe sections are uncoupled from one another in the drilling tower. In drilling on the land, the supply of drill pipe or other tubular sections to the tower to form the tubular string, or the removal of tubular sections from the tower when the tubular string is being removed from the tower, is not a particular problem because there are few space or equipment limitations. On an offshore barge, however, the space and equipment are limited. Moreover, on an offshore barge, considerable vertical movement of pipe is required which then brings in the effect of wind and vessel movement on suspended pipe.

Heretofore, the pipe handling capabilities on an offshore barge have been limited to the use of single boom derricks which can function to carry pipe sections between a support vessel and a pipe rack on a barge or drilling vessel. Where necessary, the derricks also serve to move pipe relative to the pipe rack and to the skidway. Movement of pipe is always a hazard because the drilling pipes and other pipes used in offshore systems are both long and heavy and are difficult to handle. Pipe can be moved in several ways. For example, it can be carried by a cable sling which attaches to the ends of the pipe, and derrick cable attaches to the cable sling at its mid point. Pipe also is handled by a single cable snugged to the pipe anywhere from its mid point to one of its ends. Regardless of how the pipe is handled, however, in high winds or on a moving vessel, it can be treacherous when attempts are made to manipulate pipe relative to the pipe rack.

It is therefore an object and purpose of the present invention to provide new and improved pipe handling systems for manipulating pipe on an offshore drilling barge in a safer manner by means of a bridge crane system combined with the pipe rack system.

SUMMARY OF THE PRESENT INVENTION

The present invention includes on an offshore drilling barge, at least one pipe rack means disposed between a single boom derrick and a pipe skidway so that the derrick can be used for loading of pipe to the pipe rack. Straddling the pipe rack means is a pair of rails on which an A-shaped bridge crane is mounted. The bridge crane is movable lengthwise of the pipe rack and crosswise to pipes loaded on the pipe rack means. The bridge crane can independently lift and move pipes both vertically and horizontally while the pipes are generally horizontal into any location along the length of the pipe rack. The maneuvering of the pipes relative to the pipe rack is accomplished independently of the single boom derrick means. The bridge crane couples to

each end of a pipe for lifting the pipe by its ends and maintaining the pipe in a horizontal position. The pipe lifting means on the bridge crane bisects the rolling support base means which provides lateral stability for the pipe relative to the pipe rack.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood when taken in connection with the description and the drawings which follow, wherein:

FIG. 1 is an illustration in plan view of an offshore semisubmersible drilling barge;

FIG. 2 is an illustration in plan view of a crane pipe conveying system according to the invention;

FIG. 3 is a view taken along line 3—3 of FIG. 2;

FIG. 4 is a view taken along line 4—4 of FIG. 3; and

FIG. 5 is a view taken along line 5—5 of FIG. 2.

BRIEF DESCRIPTION OF THE INVENTION

As illustrated in FIG. 1, a semi-submersible drilling barge 10 is provided with the usual pontoons, and carries an upper level or support floor 12 on which a drilling tower 13 is located. The pipe lengths 14 are supplied to and removed from the drilling tower 13 by endwise movement along a skidway 15 which generally extends between the drilling tower and one side of the barge and is located midway between the other transverse sides of the barge. Movement of a pipe along the skidway 15 can be by any of the usual types of equipment found on a barge for the purpose. Pipe sections 14 are generally extendable along the skidway 15 so that they can be placed on the skidway from a pipe rack or so that they can be moved from the skidway to a pipe rack.

Pipe racks 16 and 17 are located to either side of the skidway 15. The pipe racks 16 and 17 generally consist of a series of I beams spaced relative to one another and extending longitudinally and perpendicular to the longitudinal direction of the skidway 15 so that a pipe section 14 may be racked or stacked in position on top of the I beams. Vertical end stops 18 are provided to prevent pipe sections from falling off the ends of the pipe racks.

It is necessary in a drilling operation to supply pipe sections sequentially to the skidway 15 or sequentially to remove the pipes from the skidway. It is also necessary to keep the pipes stacked or racked upon the pipe racks 16 and 17 in a neat and orderly fashion with respect to one another.

Heretofore, it has been customary to use a single boom crane or derrick 19 or 20 on the drilling barge for the handling of the pipe. A typical single boom crane 19 is mounted on one of the transverse sides of the barge and is rotatable about a vertical axis while the angle of its boom can be changed with respect to the floor of the barge. The single boom crane 19 can also be used to convey pipe sections from an adjacent loading boat to the floor of the barge. Two cranes are common because it is desirable to have the option of loading or unloading pipe sections from both sides of a barge. With a crane of this type, the pipe can be carried by the crane with its cable attached to the center of a pipe section, with its cable attached between an outer end of a pipe section and its said section, or with its cable attached to a sling cable which couples to each end of a pipe section. In any event, this handling of pipe sections on an offshore barge gives rise to pipe manipu-

lation problems in locating, moving or disposing pipe on a pipe rack in a relative and orderly relationship. This is particularly true in high winds and seas where the wind forces affect the maneuverability of a pipe carried by a single cable. Both wind forces on the crane and/or pipe and the rolling characteristics of a floating vessel on the high seas can create a problem.

In accordance with the present invention and system, it is contemplated that pipe sections would be brought aboard or positioned with respect to a pipe rack on the barge by a single boom crane 19 or 20. After this initial positioning relative to a pipe rack, a second pipe manipulating system is employed for proper stacking, moving or disposal of the pipe relative to the pipe rack. As illustrated in FIGS. 2 - 4, the pipe manipulating system of the present invention includes a pair of spaced apart guide rails 21 and 22 which support and provide a guiding base for a pair of A frames 23 and 24 having guide wheels 25 and 26 thereon. The guide wheels 25 and 26 for an A frame are located near the extremities of the base of the A frame. The upper and narrower part of the A frame are connected to a transverse cross beam structure 27. The cross beam structure 27 carries spaced apart hook means 28 and 29 for coupling to a pipe section at its ends. The hooks 28 and 29 are located in a vertical plane which bisects the A frames so that the wheels 25 and 26 are equidistantly spaced from the vertical plane and provide a stable support base. Hence, a pipe section can be supported by the cross beam in a horizontal position between the A frames by coupling to the ends of a pipe section. The lower center of gravity and the stabilizing function of the A frame relative to the rails provide an extremely stable base for picking up and moving a pipe vertically and horizontally relative to the pipe rack. Even in high winds and on a rolling vessel, there is little danger of a pipe section getting out of control and pipe sections can be moved relative to the pipe rack in any desired function of stacking or use independent of single boom cranes.

The overhead cross beam frame 27 includes a pulley and cable system coupled to the hook means 28 and 29. The cable for the hook means 28 is passed over a sheave 30 in a sheave rack 31 to a spooling drum 32. The cable for the hook means 29 is passed over a sheave 33 in a sheave rack 34 to the spooling drum 32. The spooling drum means 32 can be arranged to spool the cables independently or jointly as necessary. The sheave racks 31 and 34 have longitudinally displaced sets of pin openings for relocation of the sheaves 30 and 33 to accommodate different lengths of pipe sections between the A frames.

Referring now to FIGS. 1 and 4, in particular, the guide rails 21 and 22 extend between the transverse sides of the barge. The skidway 15 is elevated relative to the rails and may be on the same level as the pipe racks. The portion of the skidway 15 which extends over the rail 22 is provided with hinged door means 35. The A frame 24 which rides on the rail 22 is provided with forward and rearward door guides 36 and 37 which are shaped to engage and open the hinged door means 35 to permit the pipe rack means to traverse from one pipe rack 16 to the other pipe rack 17.

The pipe manipulating system is secured for sliding movement only relative to the rails 21 and 22 by means of roller sets 38 and 39 located on each of the frames 23 and 24 at opposite sides of the transverse center line of the beam 27. A roller set 38 includes rollers 40 and

41 which are mounted on the horizontal member of the A frame 24. The rollers 40 and 41 are arranged to engage the inner surface of the recess of the rail 22 and journaled for rotation about vertical axes. The supports 42 and 43 for the rollers 40 and 41 are attached to the horizontal member of the A frame 24. Thus, the A frames are prevented from derailment by virtue of the roller attachment to the rails.

The pipe racking means is moved relative to the rails by means of a chain drive system. As shown in FIG. 4, a chain 44 is extended along the rail 22 and includes a loop over idler sprockets and a drive sprocket 45 on the frame. A motor 46 provides power to the drive sprocket 45 which positively engages the chain to move the pipe racking means in the desired direction.

While particular embodiments of the present invention have been shown and described, it is apparent that changes and modifications may be made without departing from this invention in its broader aspects; and therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. An offshore drilling system including platform means adapted to be located above the water surface, drilling means located on said platform means for carrying on drilling operations, skidway means on said platform extending in one direction from said drilling means for accommodating the longitudinal length of a drill pipe section so that a pipe section can be disposed longitudinally in said skidway means and can be moved lengthwise to and from said drilling means, pipe rack means for stacking and retaining pipe sections for use in the drilling operations, said pipe rack means being disposed transversely to said skidway means, guide rail means straddling said pipe rack means from said skidway means across the length of said pipe rack means, means for manipulating pipe sections horizontally and vertically along the length of said pipe rack means including U-shaped frame means disposed across the width of said pipe rack means, wheels for supporting said frame means relative to said guide rail means and for permitting said frame means to traverse said pipe rack means, and independent means on said frame means for coupling to opposite ends of a pipe section for manipulating said pipe section vertically with respect to said pipe rack means.
2. The apparatus as defined in claim 1 and further including pipe rack means disposed transversely to said skidway means on either side of said skidway means, said skidway means being disposed above said guide rail means.
3. The apparatus as defined in claim 2 wherein said frame means has A shaped end members, each of said end members having a pair of wheels disposed near the ends of the base of the A member and said independent means being disposed in a vertical plane extending through the center of said end members.
4. The apparatus as defined in claim 3 wherein said skidway means includes door means over said guide rail means and said frame means includes means for open-

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ing said door means upon traverse of said frame means relative to said skidway means.

5. The apparatus as defined in claim 4 and further including in said independent means, a cable and hook means and means for selectively adjusting the spacing between said independent means to accomodate different lengths of pipe.

6. An offshore drilling system including platform means adapted to be located above the water surface,

drilling means located on said platform means for carrying on drilling operations, said drilling means being located centrally of said platform means,

skidway means on said platform for accomodating the length of a drill pipe section so that a pipe section can be disposed longitudinally in said skidway means between said drilling means and one side of said platform means,

pipe racking means disposed between said skidway means and the transverse sides of said platform means, said pipe racking means being adapted to receive pipe sections and stack such pipe sections parallel to the length of said skidway means,

crane means having cable means for moving pipe to and from said pipe racking means from a loading vessel, and

pipe manipulating means for said pipe racking means

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including a pair of guide rails disposed transversely to said skidway means and extending the length of said pipe racking means, bridge crane means include side members and a transverse member, said side members having forward and rearward wheels for rolling and tracking engagement with said guide rails, said transverse member having spaced apart pipe coupling means for coupling to ends of a pipe and for moving said pipe vertically with respect to said transverse member.

7. The apparatus as defined in claim 6 wherein said skidway means is disposed above and over one of said guide rails and includes door means, and means on one of said side members for opening said door means in response to engagement therewith.

8. The apparatus as defined in claim 6 and further including means for moving said bridge crane means relative to said guide rails.

9. The apparatus as defined in claim 8 wherein said moving means includes a chain extending lengthwise of one of said guide rails and sprocket driving means engaging said chain and attached to one of said side members.

10. The apparatus as defined in claim 9 wherein said side members further have guide rollers for engaging said guide rails and preventing derailment.

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