United States Patent [19]

Eddy et al.

[11] **3,922,825**

[45] **Dec. 2, 1975**

[54] **SYSTEM FOR ERECTING AN OIL WELL DERRICK**

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[73] Assignee: **Dresser Industries, Inc.,** Dallas, Tex.

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[21] Appl. No.: **537,226**

Related U.S. Application Data

[63] Continuation of Ser. No. 353,033, April 20, 1973, abandoned.

[52] **U.S. Cl.** **52/116;** 52/741; 173/151

[51] **Int. Cl.²** **E04H 12/34;** B66C 23/60

[58] **Field of Search** 52/116, 741; 173/151

[56] **References Cited**

UNITED STATES PATENTS

3,141,653	7/1964	Jenkins	52/116 X
3,181,658	5/1965	Bender	52/116
3,228,151	1/1966	Woolslayer et al.	52/116 X
3,807,109	4/1974	Jenkins et al.	52/120

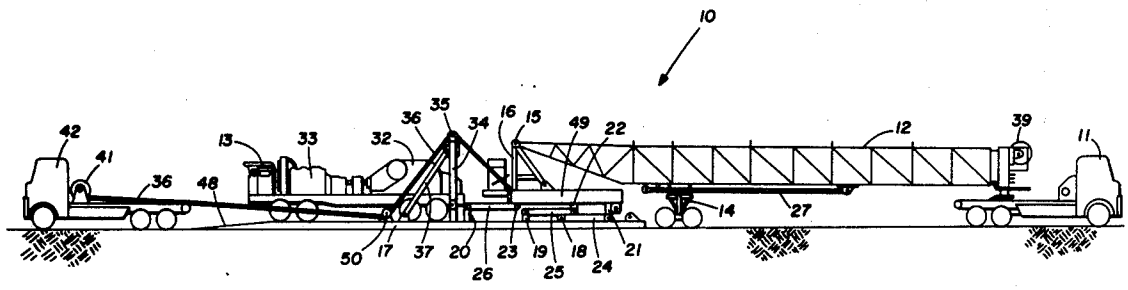
Primary Examiner—Alfred C. Perham

Attorney, Agent, or Firm—Eddie E. Scott; Michael J. Caddell

[57] **ABSTRACT**

A system for quickly and easily erecting or disassembling an oil well derrick. A stationary base is positioned at the well site. A movable base is connected to the stationary base by a multiplicity of struts. The struts are connected to both the stationary base and the movable base by pin connections that allow the struts to rotate relative to said bases. A reclining oil well derrick mast is coupled to the movable base by a rotatable connection. A force is applied to the movable base causing the struts to pivot on the stationary base and rotate on the movable base and rise to an elevated position.

4 Claims, 4 Drawing Figures



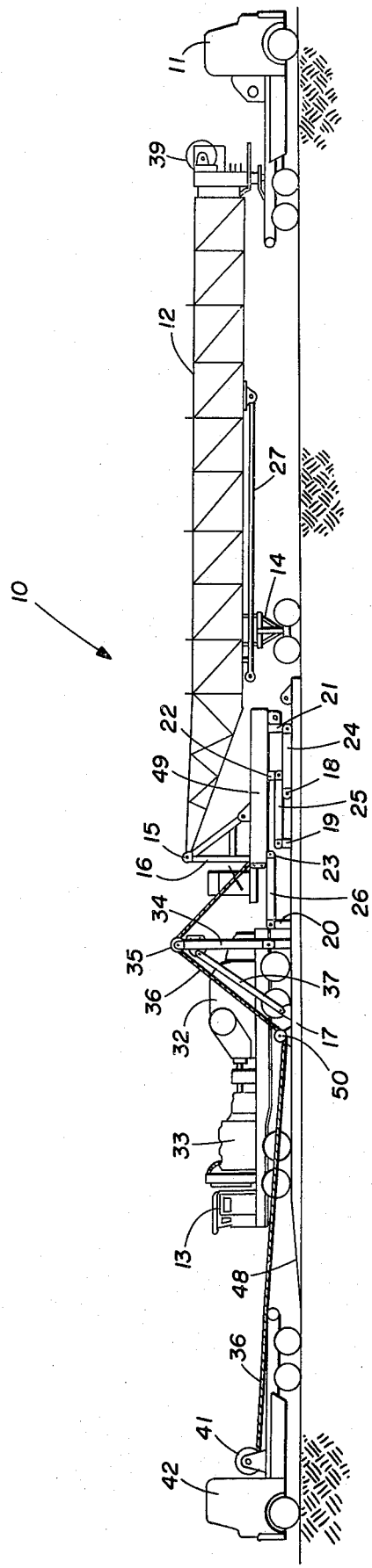

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FIG. 1

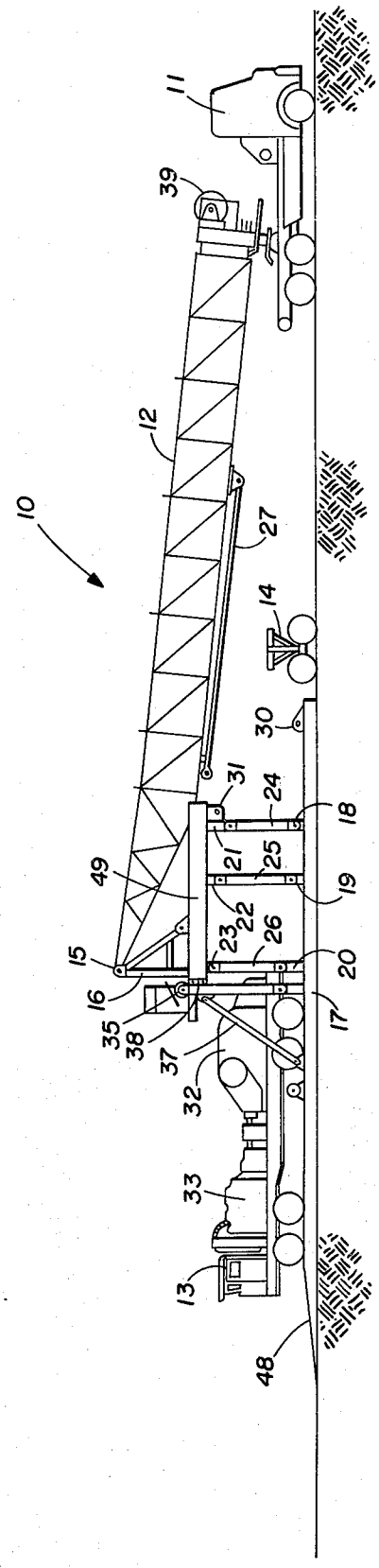

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FIG. 2

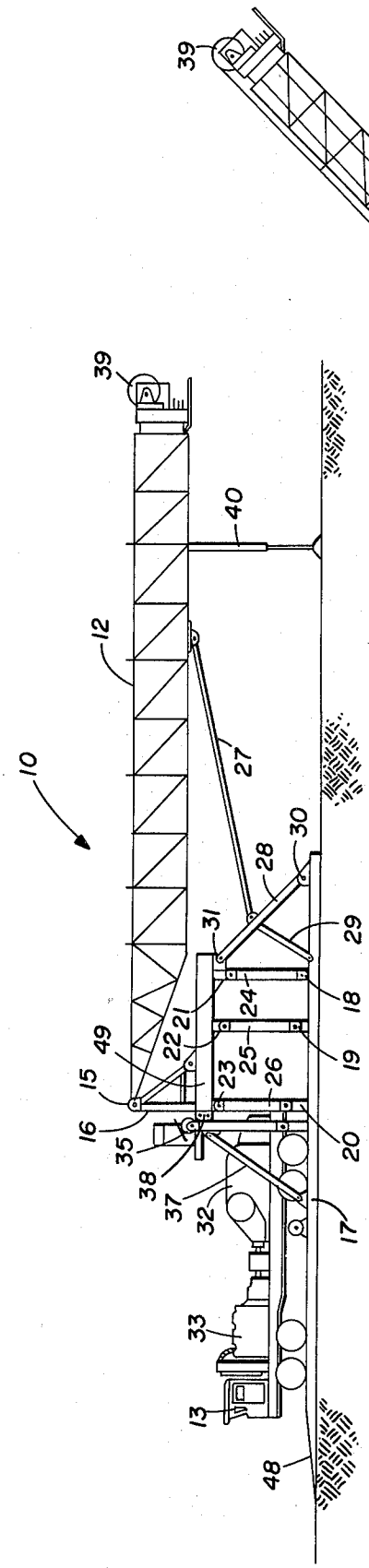

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FIG. 3

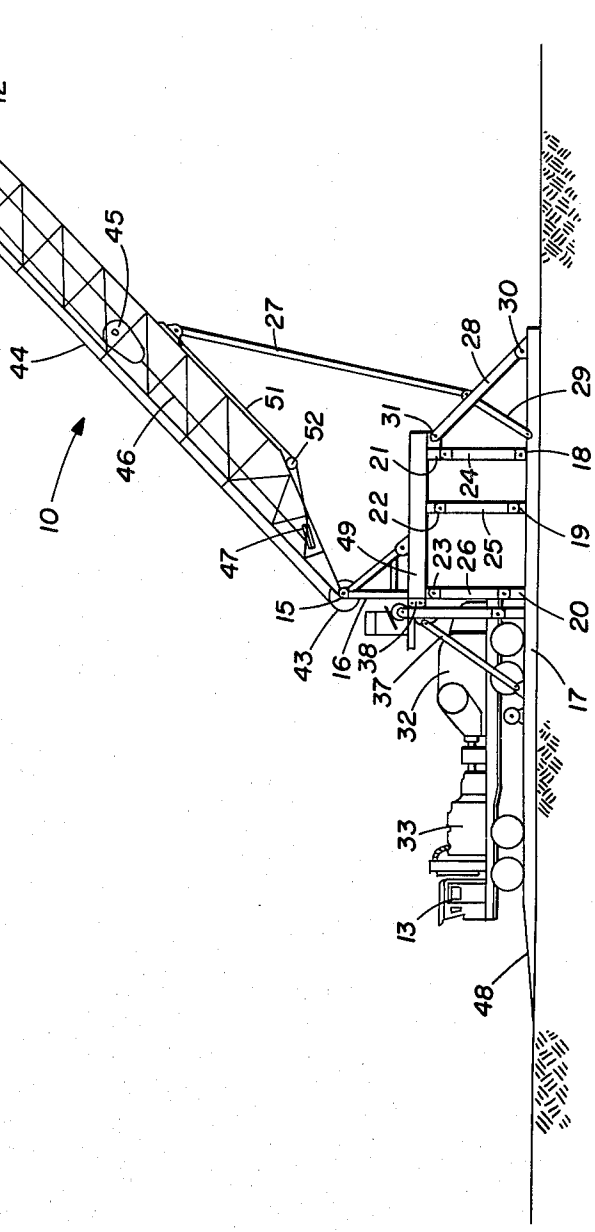

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FIG. 4

SYSTEM FOR ERECTING AN OIL WELL DERRICK

This is a continuation of application Ser. No. 353,033, filed 4/20/73, and now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a system for transporting, erecting and disassembling an oil well derrick.

It has become necessary for the oil well drilling industry to utilize extremely tall masts and high substructures in order to economically and efficiently drill deep oil wells. Due to the extreme height of these masts and substructures, which for instance may comprise a total height of about 170 feet, severe problems are presented in the transportation, erection and subsequent disassembly of the structures. In particular, the height of the substructures has created problems since these substructures may be 25–30 feet in height.

The erection of the masts is often expensive and time consuming. Further, safety hazards arise during the erection and disassembly of the tall masts and high substructures. After the erection of the high substructure, expensive and bulky truck ramps have often been required in order to raise the draw works and associated structure up to the drilling floor.

DESCRIPTION OF PRIOR ART

In U.S. Pat. No. 2,963,124 to H. J. Woolslayer et al., patented Dec. 6, 1960, a system for erecting an oil well drilling mast is shown. The erection line is strung up in such a way that the traveling block connected to the erection line will reach its upper limit of travel before the mast has been swung fully upright. The mast is then supported in an inclined position by independent means while the traveling block is returned to the lower part of the mast. After the traveling block has been returned to the lower part of the mast, the traveling block is then pulled toward the head of the mast to cause the erection line to raise the inclined mast further toward an upright position.

In U.S. Pat. No. 3,228,151 to J. R. Woolslayer et al., patented Jan. 11, 1966, an oil well drilling rig requiring an extremely tall substructure is shown. The rear legs of the mast are detachably connected to the upper part of the substructure. The lower ends of the front legs of the mast are pivotably supported so that after the rear legs have been disconnected from the substructure the mast can be swung forward and away from it and down to a reclined position in front of the substructure. The substructure is then lowered by swinging the floor unit of the substructure with the draw works mounted on it to be ground toward the reclining mast.

In U.S. Pat. No. 3,141,653 to C. Jenkins, patented July 21, 1964, an oil well drilling structure is shown. This oil well drilling structure includes a hinged mast of great height and weight that can be swung to an upright position by the traveling block.

In U.S. Pat. No. 3,262,237 to C. Jenkins et al., patented July 26, 1966, an oil well drilling apparatus with high floor in mast and gin pole is shown. The draw works and rotary table can be located many feet above the ground even though the mast and gin pole are mounted on a relatively inexpensive low base instead of the the tall substructure. The draw works and rotary table can be supported by the mast and gin pole, and the mast is suitable for use with the rotary table drive independent of the draw works.

In U.S. Pat. No. 3,483,933 to N. D. Dyer et al., patented Sept. 16, 1969, oil well derrick erection and support system is shown. A reclining mast is coupled at a pivot to a low profile base. A draw works is mounted on the low profile base. Spaced-apart pulleys are mounted on the A-frame and three pulleys are mounted on each side of the mast. A cable is anchored at two ends to the A-frame and threaded over the top most of the pulleys and on the mast and thence to the pulleys on the A-frame. The cable then runs into the middle pulley on the mast and over the lower most pulley to the traveling block. A single upward traverse of the traveling block to the crown block of the system erects the mast.

SUMMARY OF THE INVENTION

The present invention provides a system that will facilitate the transportation, erection and disassembly of an oil well derrick having an elevated substructure. A stationary base is positioned at the well site. A reclining mast is connected to a movable base by a rotatable connection. Means are provided for moving and elevating the movable base relative to the stationary base. When the substructure is raised to its operating level, the mast base is also raised to its operating level. The mast is raised to an upright position by rotating it relative to the rotatable connection on the movable base. The operation is reversed when the oil well derrick is being disassembled. This arrangement allows the height of the substructure to be lowered for transportation and, in the same operation, lowers the mast to ground level where it is easily disassembled. The above and other features and advantages of the present invention will become apparent from a consideration of the following detailed description of the invention when taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a reclining mast connected to a substructure in the lowered position.

FIG. 2 shows the substructure moved to its elevated position.

FIG. 3 shows the mast after it has been disconnected from the transporting vehicle.

FIG. 4 shows the mast being raised to its upright position.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, an oil well derrick generally designated by the reference number 10 is shown in position for erection. The various components of the oil well derrick 10 are transported to the well site by a multiplicity of trucks with trucks 11, 13 and 42 being shown in FIG. 1. The derrick mast 12 is transported in a reclining position with the top of the mast 12 carried by truck 11 and a dolly 14. The dolly 14 is attached to the mast near its lower end.

A stationary substructure base 17 is positioned at the well site and a movable substructure base 49 is located above the stationary substructure base 17. Struts 24, 25 and 26 connect the movable substructure base 49 to the stationary substructure base 17. Strut 24 is connected to the movable substructure base by a rotatable connection 21 and is connected to the stationary substructure base 17 by a rotatable connection 18. Strut 25 is connected to the movable substructure base 49 by a rotatable connection 22 and is connected to the sta-

tionary substructure base 17 by a rotatable connection 19. Strut 26 is connected to the movable substructure base 49 by a rotatable connection 23 and is connected to the stationary substructure base by a rotatable connection 20. The aforementioned rotatable connections are pin connections formed by a pin that projects through an eye on the struts and brackets that project from the movable base and stationary base.

An A-frame strut 34 is connected to the stationary substructure base 17. An A-frame brace 37 is connected between the upper portion of the A-frame strut 34 and to the stationary substructure base 17 to provide a rigid A-frame support. A raising line 36 is attached to the movable substructure base 49 and is threaded over a raising line sheave 35 affixed to the top of the A-frame strut 34. The raising line 36 is then threaded under a sheave 50 that is affixed to the stationary substructure base 17. The raise line 36 is connected to a winch 41 on the winch truck 42.

A truck 13 carrying the draw works 32 and the engine 33 that powers the draw works 32 is positioned on the stationary substructure base 17. The truck 13 may be driven up an inclined ramp 48 to its position on the stationary substructure base 17.

The mast 12 is connected to the movable substructure base 49 by a mast pivot 15. The mast pivot 15 being a pin connection provides a rotatable connection between the mast 12 and the movable substructure base 49. The mast pivot 15 is located on a mast base pedestal 16 that forms part of the movable substructure base 49.

The fundamental structural details of an oil well derrick 10 embodying the present invention having been described the operation of the system for erecting an oil well derrick will now be considered. A force is applied to the movable substructure base 49 by tightening the raising line 36 using the winch 41. This force causes the movable substructure base 49 to move relative to the fixed substructure base 17. The movable substructure base 49 rises carrying with it the lower end of the mast 12. Once the movable substructure base 49 is in the elevated position shown in FIG. 2, the movable substructure base 49 is attached to the A-frame strut 34 by a pin connection 38. The dolly 14 may then be removed.

The top of the mast 12 is disconnected from the truck 11 and supported by a support 40 as shown in FIG. 3. A brace 28 is connected between the movable substructure base 49 and the stationary substructure base 17. Brace 28 is connected to the movable substructure base 49 by a pin connection 31 and is connected to the stationary substructure base 17 by a pin connection 30. A support brace 29 is connected between the brace 28 and the stationary substructure base 17. A raising leg 27 that is attached to the mast 12 by a sliding connection is connected to the brace 28. The raising leg 27 assists in raising the mast 12 to the upright position.

Referring now to FIG. 4, the mast 12 is shown being raised to the fully upright position. The drill line 44 from the draw works 32 passes over a breakover sheave 43 affixed to the mast base pedestal 16 and is threaded through the crown block 39 and the traveling block 45. A mast raising sling 51 is connected to the traveling block 45. The mast raising sling 51 passes over sheave 47 connected to the lower portion of the mast 12 and a wheel 52 connected to the mast 12 and is connected to the top of the raising leg 27. The drill line 44 is wound on a drum in the draw works 32 causing the traveling block 45 to move toward the crown block 39. Movement of the traveling block 45 draws the mast raising sling 51 over sheave 47 and wheel 52 causing the top of the raising leg 27 to traverse mast 12 and raise mast 12 to the fully upright position. It will be appreciated the derrick 10 may be easily and quickly disassembled by reversing the operation described in connection with erecting the mast.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of erecting an oil well derrick from a reclining position to an upright position, comprising the steps of:
positioning a stationary base at a well site,
connecting a movable base to said stationary base by means that will allow the movable base to be elevated relative to said stationary base,
connecting a reclining derrick mast to the movable base by a rotatable connection,
elevating said movable base relative said stationary base, and
rotating said mast on the rotatable connection until the mast is in its erect position.

2. An oil well derrick, comprising:
a stationary base,
a movable base,
a mast,
connection means for rotatably connecting said mast to said movable base, and
elevating means connecting said movable base to said stationary base for elevating said movable base with said mast connected to said movable base.

3. The oil well derrick of claim 2 wherein said elevating means includes a multiplicity of struts, rotatable means for rotatably connecting said struts between said movable base and said stationary base and force means for causing said struts to rotate.

4. A mast erection system for an oil well derrick having a reclining mast extending away from the base of the derrick along the ground, comprising:
a movable base,
a rotatable connection between said movable base and said reclining mast,
at least one strut connected to said base of the derrick by a rotatable connection and connected to said movable base by a rotatable connection, and
force means for causing said movable base to move relative to said base of the derrick.

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