United States Patent [19]

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[11] 3,755,932

[45] Sept. 4, 1973

[54] JACK-UP DREDGE

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[22] Filed: **June 23, 1971**

[21] Appl. No.: **155,934**

[52] **U.S. Cl.** **37/67**, 37/56, 61/46.5

[51] **Int. Cl.** **E02f 3/88**

[58] **Field of Search** 37/56, 73, 67; 61/46.5

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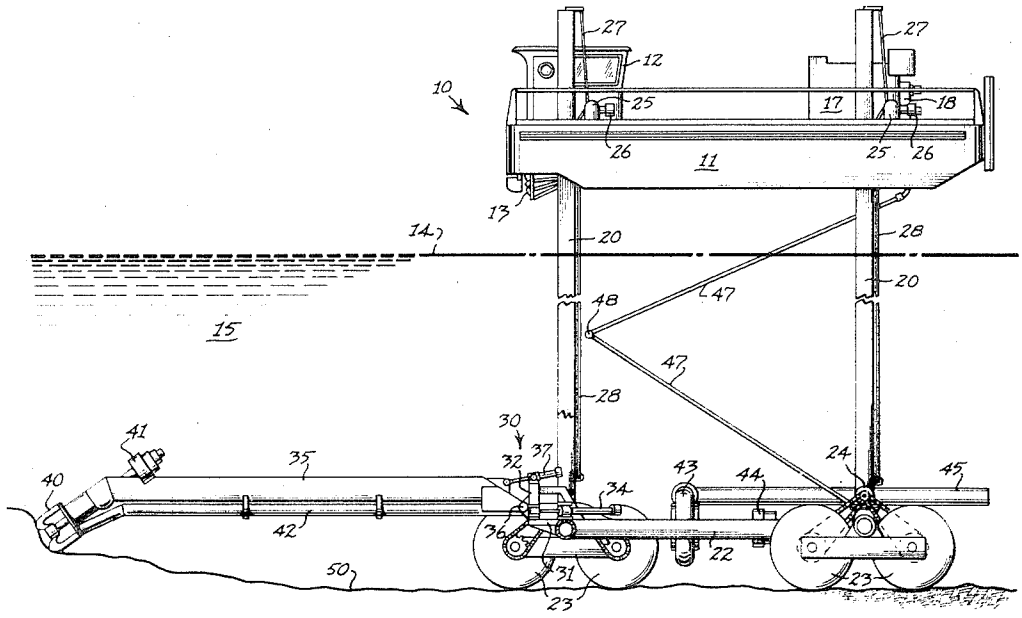
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[57] **ABSTRACT**

A dredge having a hull connected to a mobile platform by vertically extendable and retractable legs so that the mobile platform can be lowered to engage and move over the bottom of a body of water, and further so that the hull can be jacked-up above the surface of the water after the platform has engaged the bottom. Mounted upon the platform for operative engagement with the bottom is the dredging tool, such as a rotary cutter head, which may be mounted on the outer extremity of a ladder swingably mounted at its inner end to the platform. The hull is adapted to be propelled on the surface of the water when the platform is retracted, and is also adapted to support personnel and the controls for the operation of the dredge. A separate propulsion means is provided for moving the platform along the bottom.

1 Claim, 2 Drawing Figures



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SHEET 1 OF 2

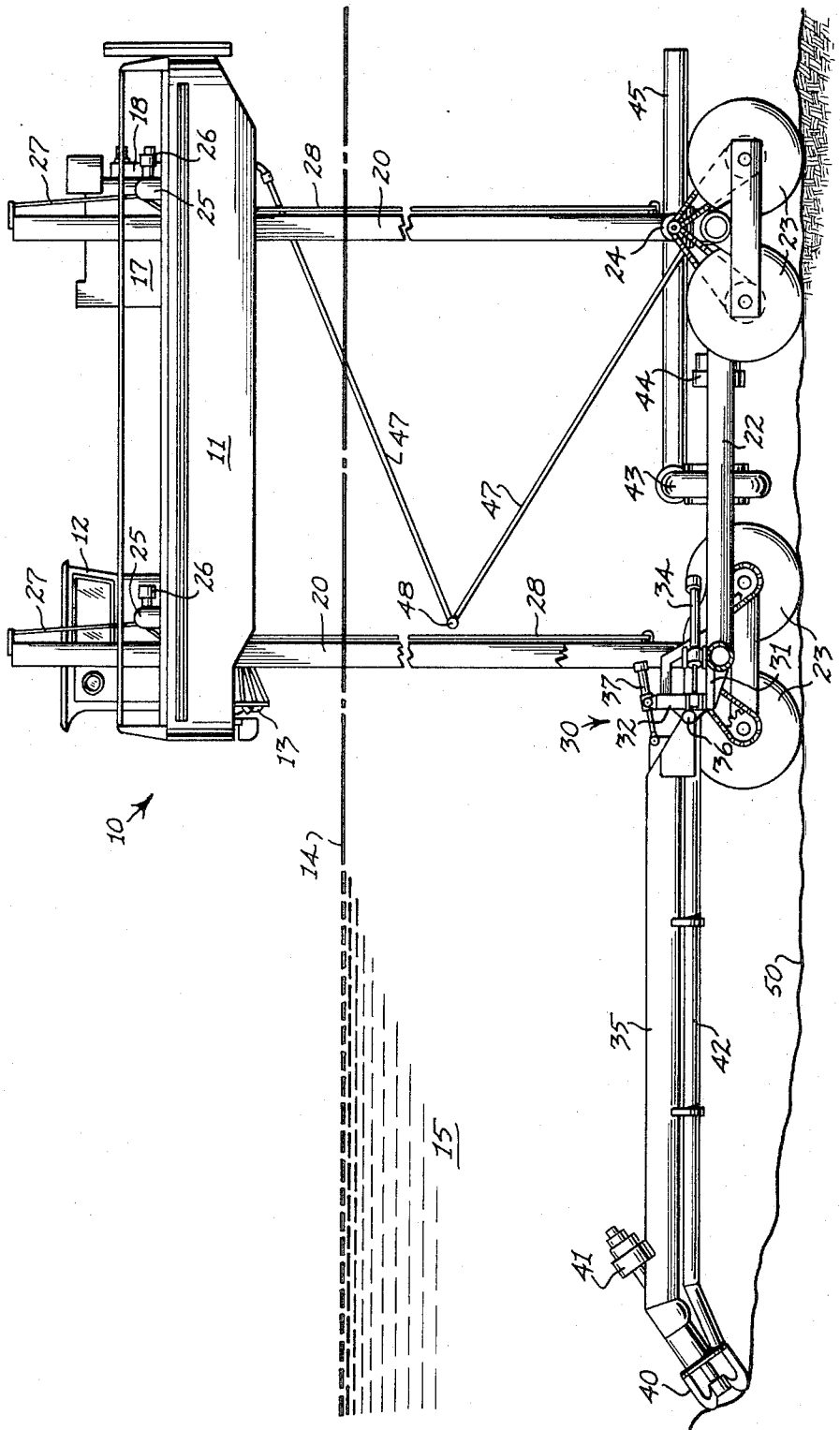


Fig. 1

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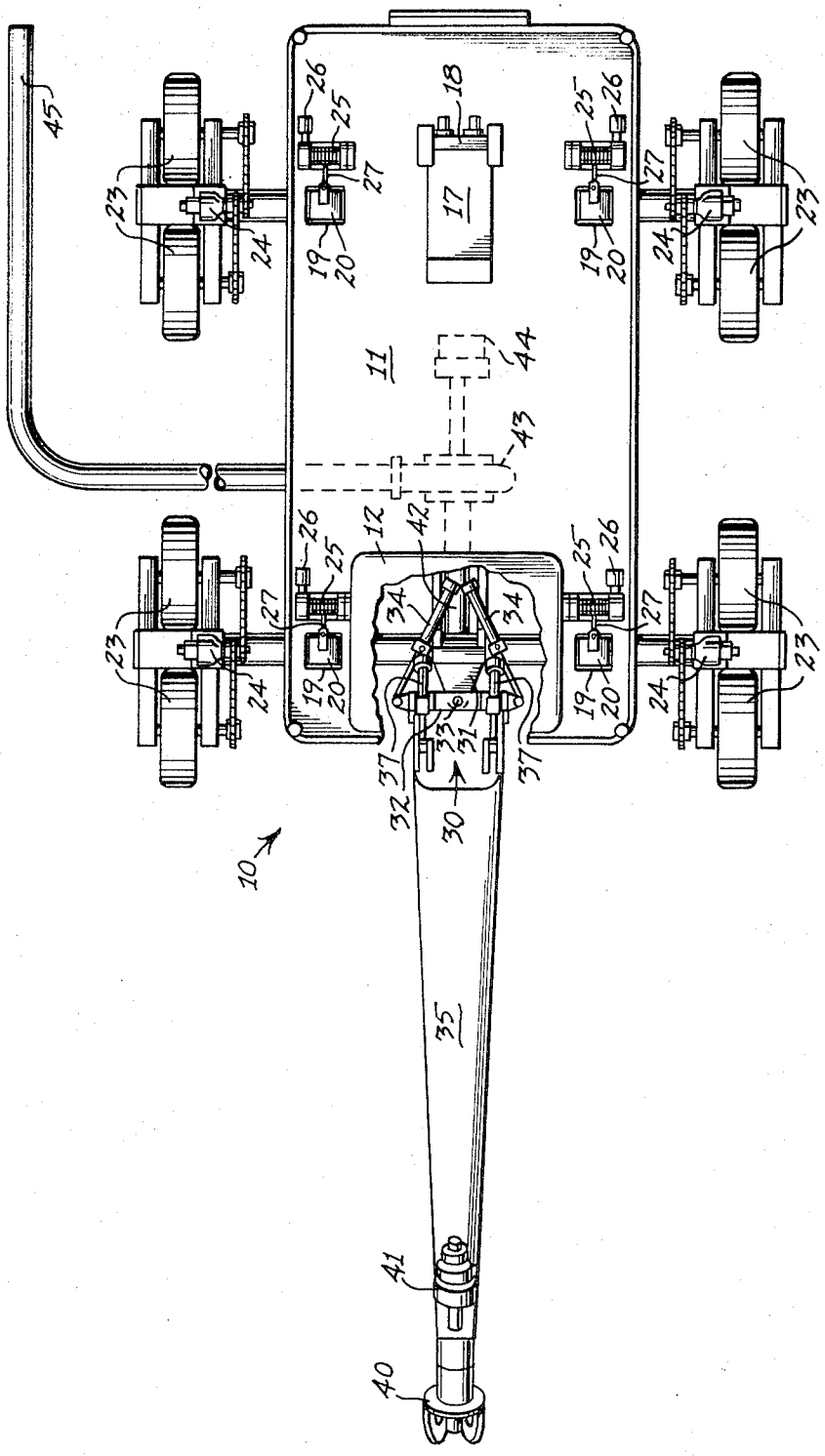


Fig. 2

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JACK-UP DREDGE

BACKGROUND OF THE INVENTION

This invention relates to a hydraulic dredge, and more particularly to a hydraulic dredge having a mobile, jack-up platform.

Conventional hydraulic dredges include an elongated hull to the front end of which is swingably mounted about horizontal and vertical axes a ladder supporting a rotary cutter head. A suction pump is mounted on the hull and connected by a suction pipe to the cutter head for removing the spoil. Vertically reciprocable spuds are supported on the hull to anchor the hull to the bottom, and also to provide a pivot post for swinging the hull during the dredging operation. Spuds are also employed in conventional dredges for advancing the hull as the cutter head sweeps progressively from one cut to the next.

Also known in the art are floating platforms or hulls provided with jack legs to permit the hull to be jacked above the surface of the water.

SUMMARY OF THE INVENTION

The hydraulic jack-up dredge made in accordance with this invention includes a hull having means for propelling the hull upon the surface of a body of water. The hull carries, for vertical reciprocal movement, jack-up legs fixed to a submerged mobile platform. The legs may be driven up to retract the platform to a position beneath and proximate to the dredge hull, or they may be driven down until the mobile platform engages the bottom of the body of water. Continued downward driving of the jack-up legs causes the hull to be elevated until it is suspended above the surface of the water, and preferably above the waves.

Mounted on the front end of the platform is a ladder supporting a dredging tool. The ladder is mounted upon the platform for vertical and horizontal swinging movement. The cutter head is connected through a suction pipe to a suction pump, preferably mounted upon the platform, and to which is connected a discharge pipe. Motor means are provided, also preferably on the platform, for driving bottom-engaging wheels supported on the platform.

Thus, with the platform in retracted position, the hull may be propelled to any desired location in a relatively shallow body of water for dredging, the legs extended until the platform wheels engage the bottom, and further extended until the hull is jacked up above the water surface. The rotary cutter head is then driven, and the ladder is swung from side to side for dredging the bottom of the body of water. The cutter head is advanced by driving the wheels to move the platform forward, while the hull functions as a control and operations platform for the dredge personnel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the jack-up dredge, made in accordance with this invention, in its operative dredging position with the legs extended and the hull jacked above the water line, and with portions broken away to clarify the construction; and

FIG. 2 is a top plan view of the jack-up dredge disclosed in FIG. 1, with portions broken away.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in more detail, the jack-up dredge **10** made in accordance with this invention includes an elongated hull **11** having a control cabin **12** mounted adjacent the stern. Twin-screw propellors **13** are mounted beneath the stern for propelling the hull **11** along the surface **14** of a body of water **15**. Mounted adjacent the bow of the hull **11** is a diesel engine **17** for driving a hydraulic pump **18** which supplies hydraulic fluid to the various hydraulic drives associated with the dredge **10**.

Received in recesses or wells **19** in the hull **11** for vertical reciprocal movement are a plurality of jack legs **20**, four of which are disclosed in the drawings. The legs **20** are of equal length substantially greater than the depth of the body of water **15** in which the dredge **10** is to be operated. For example, if the dredge is to be operating in 20 feet of water, the legs **20** are typically about 30 feet long. To the bottom ends of the legs **20** is fixed a mobile platform **22** preferably of hollow construction to render the platform **22** buoyant. Mounted on both sides of the mobile platform **22** are sets of wheels **23** which are positively driven by submersible hydraulic motors **24**.

A winch **25** is mounted on the deck of the hull **11** for raising and lowering each jack leg **20**. Each winch **25** is driven by hydraulic motor **26**. One end of an upper cable **27** is fixed to the upper end of each leg **20**, while the opposite end of the upper cable **27** is wound in one direction around winch **25**. One end of a lower cable **28** is fixed to the bottom of the jack-up leg **20**, while its opposite end is wound in the opposite direction around the winch **25**. Each winch motor **26** is provided with reversible fluid valve controls for reversing the direction of rotation of the winch **25** in order to selectively lift or lower each leg **20**.

In this particular embodiment of the jack-up dredge **10**, the front end of the platform **22** is located beneath the stern of the hull **11**, while the rear end of the platform **22** is located beneath the bow of the hull **11**.

Mounted on the front end of the platform **22** is a gimbel **30** including a tongue **31** fixed to the front end of the platform **22** and a yoke frame **32** mounted on pintle **33** to swing about a vertical axis relative to the tongue **31**. Also, mounted on the front end of the platform **22** are a pair of hydraulic horizontal swing cylinders **34**, the piston rods of which are attached to the opposite ends of the yoke frame **32**. The cylinders **34** are adapted to be operated to react in opposite directions in order to swing the frame **32** horizontally in one direction or the other about the vertical axis of the pintle **33**.

The rear end of a ladder **35** is connected by hinge pins **36** to the yoke frame **32** for vertical pivotal movement about a horizontal axis. A pair of hydraulic vertical swing cylinders **37** are pivotally mounted on the yoke frame **32** with their piston rods connected to the rear ends of the ladder **35** in order to raise or lower the ladder **35** by reversibly controlling the hydraulic fluid to the cylinders **37**.

Mounted on the front end of the ladder **35** is the dredging tool, specifically a rotary cutter head **40** driven by a submersible hydraulic motor **41** also mounted adjacent the front end of the ladder **35**. Coupled to the cutter head **40** is a conventional suction

pipe 42 carried by the ladder 35 and running back to a suction pump 43 mounted upon the platform 22. A suitable power drive, such as the hydraulic motor 44 is adapted to drive the pump 43 in order to suck the discharge or spoil excavated by the cutter head 40 through the pipe 42, pump 43 and out through the discharge pipe 45. Suitable extension pipes not shown, may be connected to the discharge pipe 45 in order to discharge the spoil at any convenient location.

Hydraulic fluid from the pump 18 may be supplied to all of the hydraulically driven devices, such as the wheel motors 24, pump motor 44, horizontal swing cylinders 34, vertical swing cylinders 37, and cutter head motor 41, by the fluid lines 47, one of which is shown in FIG. 1. As disclosed in FIG. 1, the lines 47 are hinged by coupling 48 so that they may be folded when the platform 22 is retracted toward the hull 11, and expanded, accordian-like, as the platform 22 is extended from the hull 11.

In the operation of the dredge 10, the ladder 35 may be fixed in any convenient position relative to the platform 22, when the platform 22 is in its retracted, elevated position proximate to the bottom of the hull 11. The hull 11 is then propelled along the water surface 14 by means of the twin-screw propellors 13 to the desired dredging location in a shallow area having a depth less than the height of the legs 20. When the location is reached, the propulsion power for the hull 11 is turned off, and the winch motors 26 actuated to move the legs 20 down. After the platform 22 has reached its lower limit with its wheels 23 engaging the bottom 50, the winch motors 26 continue to be operated in the same direction, to now cause the hull 11 to rise above the water line 14 to a jacked-up position, preferably above any waves which might buffet the hull 11. After the hull 11 has been jacked up to a safe operative position, such as that disclosed in FIG. 1, the winch motors 25 are stopped.

The operator of the dredge 10 then actuates the controls in the control cabin 12 to commence the dredging operation. The cutter head motor 41 is actuated to rotate the cutter head 40, and the ladder 35 is lowered by means of actuation of the vertical swing cylinders 37 until the cutter head 40 engages the bottom 50 to commence its cut. The ladder 35 is then swept horizontally from one side to the other by actuating the horizontal swing cylinders 34. The pump motor 44 is started to drive the pump 43 to discharge the spoil excavated by the cutter head 40 through the suction pipe 42 and discharge pipe 45. As the first swath is completed by the cutter head 40, the motors 24 may be actuated to drive the wheels 23 to move the platform 22 forward far enough for the cutter head 40 to commence its next return swath.

After the dredging operation has been completed, the cutter head motor 41, swing cylinders 34 and 37, pump motor 44 and wheel motors 24 are stopped. The winch motors 26 are then reversed to raise the legs 20 in the leg wells 19 until the platform 22 is again in its retracted, elevated position adjacent to and beneath the bottom of the hull 11. The twin-screws 13 are then driven to propel the hull 11 back to shore, or to its next dredging operation.

The jack-up dredge 10 made in accordance with this invention is particularly advantageous in dredging operations, such as beach replenishment, shallow offshore dredging and channel clearing projects, particularly where adverse weather conditions exist. The jack-up dredge 10 performs particularly well, in comparison with conventional dredges, in the cleaning of sand bars from inlets where vicious currents are present.

Where the body of water 15 is shallow enough, the ladder 35 could be operatively connected to either end of the hull 11 by means such as gimbel 30. Pump 43 could also be located either on the hull 11 or platform 22.

For some dredging operations, the hull 11 need not be floatable, but constitute an upper platform to support personnel, equipment and controls. The sole propulsion would be the motivating drive for the lower platform 22, such as wheel motors 24. The propellers 13 could be eliminated. In this instance, the dredge would be driven into the water 15 from the beach, and the upper platform 11 raised to the desired elevation above the surface 14.

What is claimed is:

1. A dredge comprising:
   a. an upper buoyant hull,
   b. self-propulsion means on said hull for propelling said hull upon the surface of a body of water,
   c. a lower mobile platform having a front end and a rear end,
   d. wheel means mounted on said lower platform for engaging the bottom of a body of water and supporting said lower platform above said bottom,
   e. hydraulic motor means on said platform for driving said wheels,
   f. vertical legs having bottom ends fixed to said lower platform and a height greater than the depth of the body of water in which said dredge operates,
   g. means on said hull receiving said legs for vertical reciprocal movement relative to said hull,
   h. reversible hydraulic motor means on said hull operatively connected to said legs for positively raising said legs to elevate said lower platform to a retracted position beneath and proximate to said hull, and to positively lower said legs to lower said platform to an extended position in which said wheels engage the bottom of the body of water and said hull is raised above the surface of the body of water,
   i. a ladder having a front end and a rear end,
   j. means mounting the rear end of said ladder on the front end of said lower platform for vertical and horizontal swinging movement of said ladder, relative to said lower platform,
   k. hydraulic swing motor means on said lower platform for positively swinging said ladder about a horizontal axis and for positively swinging said ladder about a vertical axis,
   l. a rotary cutter head mounted on the front end of said ladder,
   m. a hydraulic motor on the front end of said ladder drivingly connected to said rotary cutter head,
   n. a suction pipe operatively connected to said cutter head,
   o. a suction pump mounted on said lower platform and operatively coupled to said suction pipe for conveying and discharging the spoil from said cutter head,
   p. hydraulic motor means on said lower platform for driving said suction pump,
   q. a hydraulic pump mounted on said hull,

r. drive means on said hull operatively connected to said hydraulic pump for driving said pump, and

s. a hydraulic circuit operatively connecting said hydraulic pump to all said hydraulic motors, including a collapsible-expansible hydraulic line connecting said hydraulic pump to all said hydraulic motors on said lower platform and said ladder.

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