Sept. 9, 1958 C. E. ELLICOTT, JR 2,850,814

HYDRAULIC MECHANISM FOR DREDGE

Filed Sept. 9, 1953 3 Sheets-Sheet 1

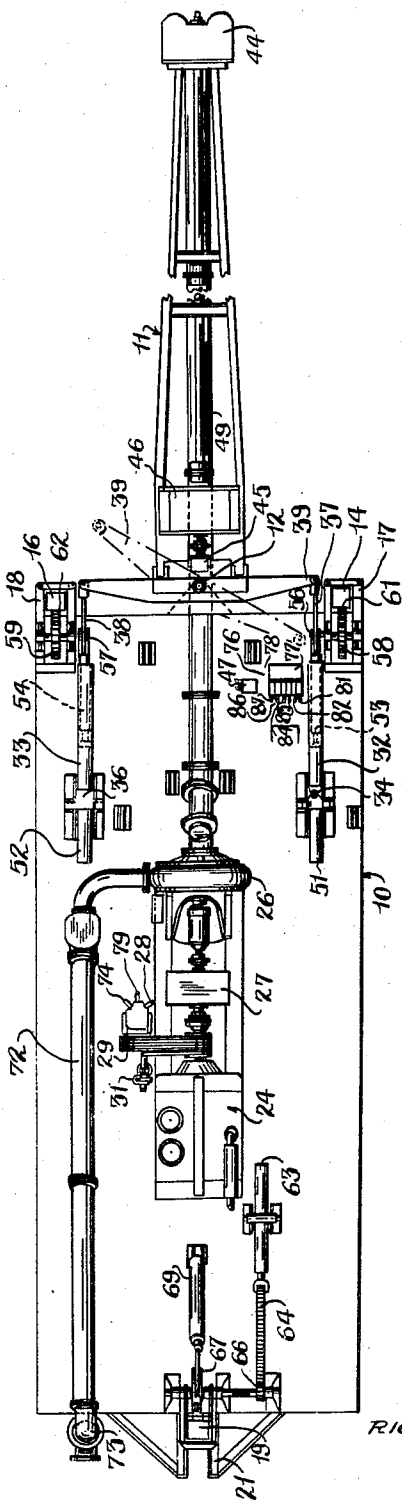

Fig. 1

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HYDRAULIC MECHANISM FOR DREDGE

Filed Sept. 9, 1953 3 Sheets-Sheet 2

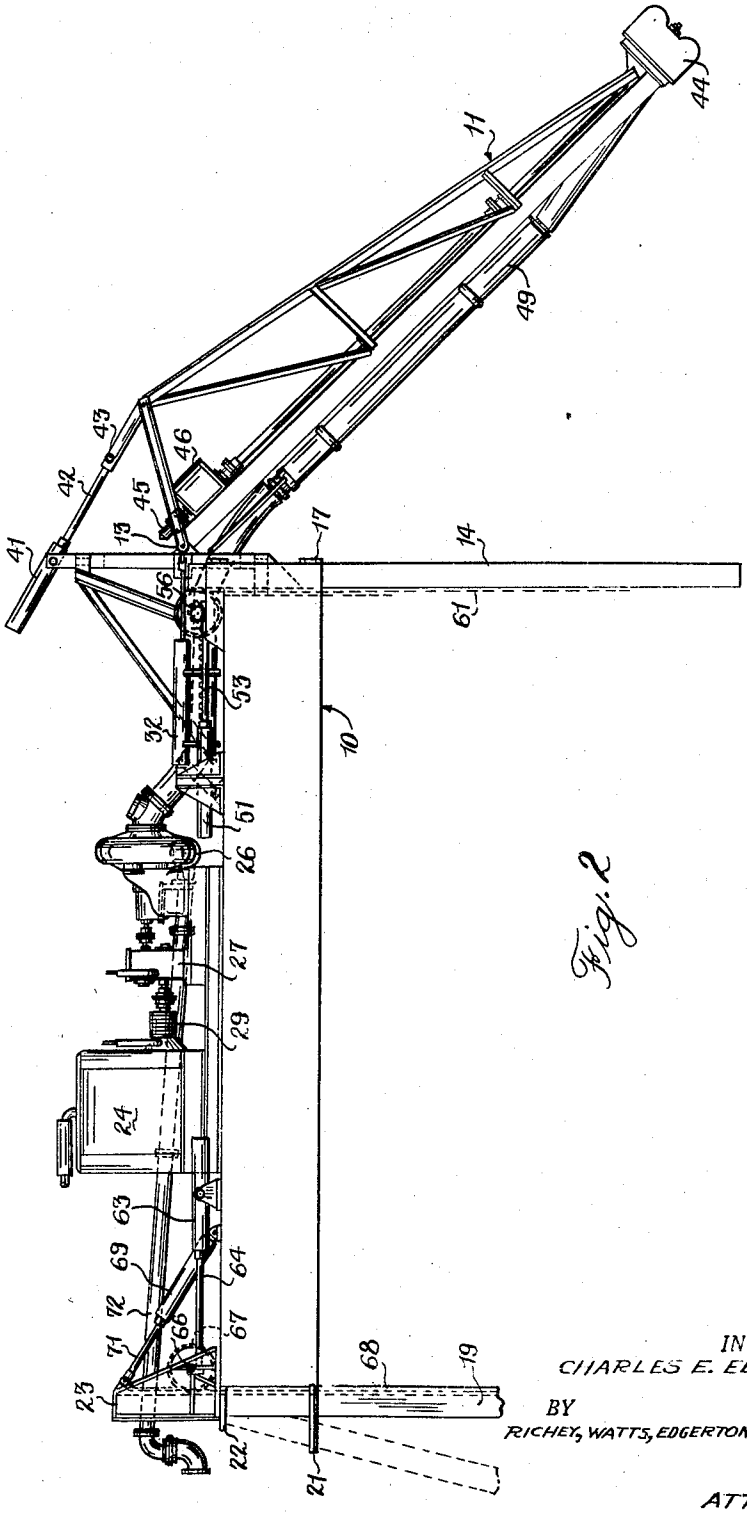

Fig. 2

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HYDRAULIC MECHANISM FOR DREDGE

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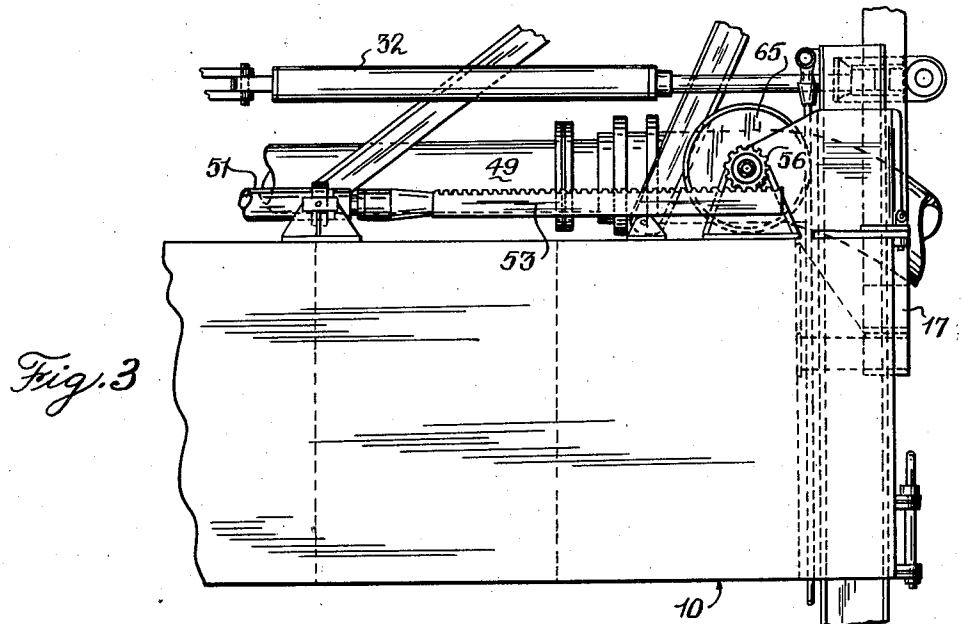

Fig. 3

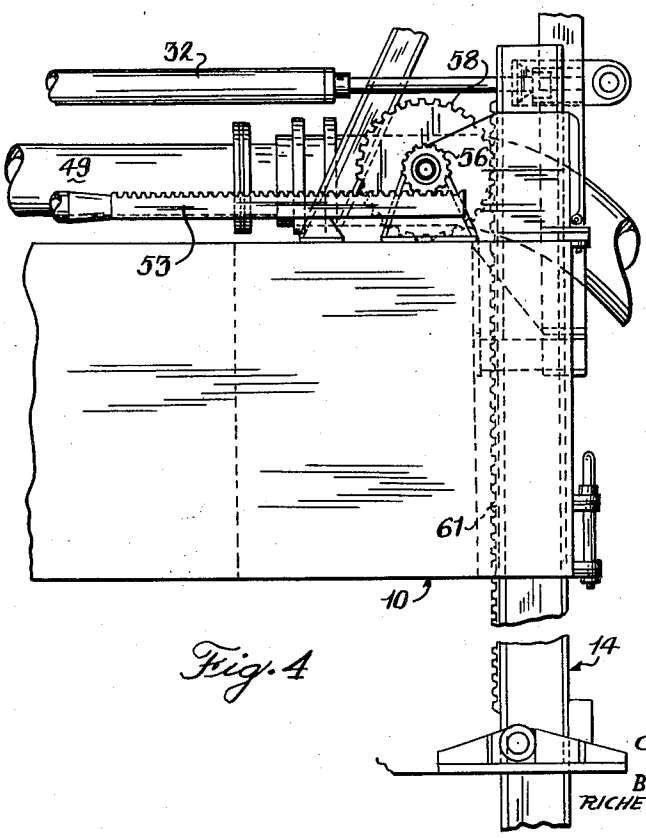

Fig. 4

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HYDRAULIC MECHANISM FOR DREDGE

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Application September 9, 1953, Serial No. 379,216

1 Claim. (Cl. 37—73)

This invention relates to dredges in general and more particularly to a hydraulic control system for a dredge provided with a ladder that may be moved laterally as well as vertically.

In the past most hydraulic dredges were provided with a ladder on which is supported the suction pipe and cutter wherein the ladder is mounted on the dredge hull in such a way as to provide vertical movement of the ladder relative to the hull.

In order to provide a dredge which may be used in confined places, this invention provides a hydraulic dredge wherein the ladder may be swung laterally relative to the hull as well as vertically. To provide this motion I provide a hydraulic power and control system to initiate and control the motion and positioning of the ladder. By providing this hydraulic system it has been possible to eliminate all of the complicated rigging necessary in dredges of the past. To provide control of the hull I also provide hydraulically operated spuds wherein one of the spuds is arranged to provide locomotion for the dredge.

It is an important object of this invention to provide a hydraulic dredge wherein the ladder may be moved relative to the dredge hull both laterally and vertically by hydraulic control means.

It is another object of this invention to provide a hydraulic dredge for use in confined places which may be easily operated by one man.

It is still another object of this invention to provide a hydraulic dredge wherein a single source of power is utilized to provide all of the power necessary on the dredge and wherein the ladder-cutter and the spuds are operated by hydraulic pressure means.

The foregoing and other objects and advantages will become apparent in view of the following description taken in conjunction with the drawings, wherein:

Fig. 1 is a plan view of a dredge incorporating this invention with some of the parts removed for purposes of clarity;

Fig. 2 is a side elevation of the dredge shown in Fig. 1;

Fig. 3 is an enlarged view of one form of the spud lifting structure using a cable and drum; and

Fig. 4 is another form of spud lifting structure wherein a rack mounted on the spud is engaged by a gear.

In a dredge according to this invention a single source of power, which is preferably diesel engine, is mounted on the dredge hull to supply the power for the main suction pump as well as the power for the control of the dredge itself and the cutter drive. The ladder is mounted on the hull in such a way as to permit lateral as well as vertical motion relative to the hull so that sweeps may be made without swinging the hull. To provide the control of the ladder in its lateral and vertical movements hydraulic motor means are provided. These hydraulic motor means may be pistons, hydraulic motors or other hydraulic actuated power means. However, in the preferred embodiment hydraulic pistons are used. In the preferred embodiment, two spuds are mounted in the front of the hull in such a way as to permit vertical adjustment thereof. Here again, hydraulic motor means are provided to accomplish the vertical adjustment of the front spuds. A single walking type spud is mounted on the stern of the hull in such a way as to permit both vertical adjustment and pivotal movement. This pivotal movement is arranged to permit movement of the lower end of the spud which movement has a horizontal component in the direction of the axis of the hull. Hydraulic motor means are provided to accomplish the vertical adjustment as well as the horizontal movement of the spud. This walking spud provides means for moving the dredge during the dredging operation.

Referring to the drawings, the hull **10** may be of standard design. The ladder **11** is mounted on the bow of the hull **10** at pivots **12** and **13**. The pivot **12** permits lateral movement and the pivot **13** permits vertical movement of the ladder relative to the hull. Forward spuds **14** and **16** are mounted on the bow of the hull **10** in such a way as to permit vertical movement through the guides **17** and **18** relative to the hull **10**. A walking spud **19** is mounted on the stern of the hull **10** in such a way as to permit both vertical and horizontal movement of the lower end of the spud. Guides **21**, **22**, and **23** are provided to support this spud while still permitting this movement. A prime mover **24**, which is preferably a diesel engine, is mounted on the hull to provide the power for the hydraulic dredge. It should be understood that other types of prime movers may be used if desired. The suction pump **26** is coupled to the diesel engine **24** through the gear and control box **27** or any other connecting means and a hydraulic control pump **28** is driven by the diesel engine **24** by means of the belts **29**. Here again the connection between the pump and engine would be determined by the particular application and this invention is not limited to the exact structure disclosed. A service pump **31** may be provided which is also belted to the engine **24**. This pump may be used for general service water, for pumping the bilge or other auxiliary duties.

In order to provide control for the ladder and the spuds hydraulic motor means are utilized which are supplied from the hydraulic pressure of the pump **28**. The hydraulic cylinders **32** and **33** are mounted at the rearward ends on the pivots **34** and **36** which are secured to the hull **10**. The piston rods **37** and **38** of the cylinders **32** and **33** attach to the ends of the lateral sweep arm **39** which is mounted on the ladder **11**. In the preferred embodiment, these cylinders **32** and **33** are double-acting so that the force applied to the sweep arm **39** is substantially symmetrical about the pivot **12**. A double-acting hydraulic cylinder **41** is mounted on the pivot **12** and is attached by means of the piston rod **42** to the ladder **11** at a point **43** spaced from the pivot **13** to provide a lever arm. When the cylinder **41** is actuated the ladder is rotated about the pivot **13** thereby raising or lowering the cutter **44**. The suction pipe **49** is suspended on the ladder **11** and is provided with an inlet adjacent to the cutter **44** at one end, the other end being attached to the inlet of the suction pump **26**.

The cutter **44** is powered by a variable speed hydraulic motor **45** through the gear box **46** and is coupled through the cutter drive control **47**. The cutter drive control and the hydraulic motor are connected in the pressure systems of the hydraulic pump **28**. By providing hydraulic power for the cutter it is possible to utilize the single source of power and still provide for speed adjustment of the cutter. It should be understood that the speed of the cutter should vary depending on the type of material being dredged.

To provide for raising and lowering of the spuds **14** and **16** double-acting hydraulic cylinders **51** and **52** are provided. The cylinders **51** and **52** are coupled to racks **53** and **54** respectively which engage and rotate the gears **56** and **57** respectively. These gears drive larger gears **58** and **59** which engage racks **61** and **62** secured to the spuds

14 and 16 respectively. It is apparent that when the racks 53 and 54 move forward they rotate the gears in a counterclockwise direction which moves the racks 61 and 62 and the spuds 14 and 16 upwardly relative to the hull 10. When the motion of the racks, due to the operation of the cylinders 51 and 52, is reversed, the spuds are lowered relative to the hull.

In another form shown in Fig. 3 the rack 61 is replaced by two cables 60 which are fixed at their ends to the extremities of the spud 14. Each cable is arranged so that it is looped around the drum 65 and anchored thereon to provide a positive connection between the drum and the spud. When the drum 65 which corresponds to the gear 58 is rotated by the rack 53 the cable 60 raises or lowers the spud 14 depending upon the direction of rotation. This structure has the advantage of eliminating some of the difficulties which might occur in the rack structure shown in Fig. 4 since the cable is less susceptible to fouling due to mud and grime.

An arrangement which is similar to the apparatus used to operate the spuds 14 and 16 is provided for the raising and lowering of the walking spud 19. Here the double-acting cylinder 63 operates the rack 64 which turns the gears 66 and 67 which raise and lower the spud 19 through the rack 68. In order to provide the horizontal movement of the walking spud 19 another double-acting cylinder 69 is provided which is pivoted to the upper end of the guide 23 by the piston rod 71. When the piston rod 71 moves the upper end of the guide 23 to the right as shown in Fig. 2, the lower end of the walking spud 19 is pivoted to the left as shown in phantom. This, of course, will move the hull 10 forward providing the spuds 14 and 16 are raised at the time.

The outlet of the suction pump 26 is coupled to a discharge conduit 72 which is provided with a swivel elbow 73. In the preferred embodiment a swivel elbow is used so that the discharge may swing laterally from side to side in order to deposit the dredged material in the desired location. Normally, in dredging canals and irrigation ditches it is the practice to discharge the dredge material over the bank. However, since bridges are often encountered in such waterways it is desirable to provide a discharge which may be swung inboard when necessary to clear the bridge or other obstruction.

In order to supply the hydraulic pressure to actuate the various cylinders and motors a hydraulic system is utilized which is shown only schematically for purposes of clarity in the drawings. The hydraulic fluid under pressure from the pump 28 flows through the outlet 74 to the inlet 76 of the control 77. A return pipe 78 on the control 77 is coupled to the inlet 79 on the pump 28. A fluid distributing network is provided between the control 77 and the various cylinders wherein the cylinder 33 and the cylinder 32 are connected to the valve 81 on the control 77. All of the valves on the control 77 are preferably double-acting so that the cylinders may be operated in either direction. In the case of the cylinders 32 and 33 the connections provide the opposite action necessary in these two cylinders. The cylinder 41 is connected to the valve 82. The cylinder 51 used to raise and lower the spud 14 is connected to the valve 83. In the same manner the cylinder 52 is connected to the valve 84.

The walking spud 19 is controlled by the valves 86 and 87 which are connected to the cylinders 63 and 69 respectively.

The hydraulic motor 45 is also connected to the fluid under pressure supplied by the hydraulic pump 28, and its speed is controlled by a valve on the control 77, therefore, it is apparent that the entire dredge is hydraulically operated from the single source of power. It is preferable that the hydraulic motor 45, or the gear box, be of the type so that the direction of rotation of the cutter 44 may be reversed. The reversing of the cutter 44 is particularly desirable in dredges wherein the ladder swings laterally because if the cutter rotates in the same direction during both traverses of the ladder inefficient operation results. This is due to the fact that the cutter tends to ride up over the material being dredged when the direction of swinging of the ladder is in the direction that the cutter tends to propel the ladder. It is desirable to provide a direction of rotation of the cutter 44 wherein the horizontal component of the lower portion of the cutter is in the same direction as the motion of the cutter caused by the swinging of the ladder. To accomplish this desired motion at all times this invention contemplates the reversing of the direction of rotation of the cutter simultaneously with the reversing of the direction of the ladder sweep.

In operation the operator may control all of the necessary elements of the dredge at the control 77. It is apparent that by merely operating the valves 81 and 82 the ladder may be moved laterally and vertically as desired. At the same time the spuds 14 and 16 may be controlled by the valves 83 and 84. When the dredge is to be moved forward or backward the valves 86 and 87 are used to operate the walking spud 19. When the speed of the cutter is to be varied the valve on the control 77 is used for this operation. Since all of the rigging and super structure necessary in prior dredges has been eliminated the applicant has been able to provide a compact easily operated dredge which is particularly well adapted for use in dredging in confined places such as irrigation ditches and small canals. However, the dredge also finds utility because of its ease in operation and simplicity in all other applications wherein hydraulic dredges are adaptable.

Having completed a detailed description of a preferred embodiment of the present invention so that others skilled in the art may be able to understand and practice the same, I state that what I desire to secure by Letters Patent is not limited by said preferred embodiment but rather is defined in what is claimed.

What is claimed is:

A dredge comprising an elongated hull, a dredge ladder mounted at one end of the hull for pivotal swinging movement about horizontal and vertical axes, a rotating cutter mounted on the outer end of the dredge ladder, hydraulic motor means for rotating the cutter mounted on the dredge ladder, an engine and dredge pump unit mounted on the hull, a hydraulic pump driven by the engine operatively connected to said hydraulic motor means, a first hydraulic means operatively connected to said hydraulic pump to swing the ladder about its horizontal axis, a second hydraulic means operatively connected to said hydraulic pump to swing the ladder about its vertical axis, spud guide means at said one end of the hull at each side of said ladder, a spud mounted for vertical movement in each of said spud guide means, means to raise and pull down each of said spuds comprising a cable drum rotatably supported on the hull adjacent the spud guide, a first cable secured to the upper end of a spud at one side thereof and to said cable drum, a second cable secured to the lower end of the spud at the same side thereof and to the cable drum, and hydraulic means operatively connected to said hydraulic pump to rotate the drum whereby the first cable is unwound from the drum as the second cable is wound onto the drum and the spud is driven down to oppose the reaction of the cutter with respect to the hull.

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