Nov. 20, 1962 S. O. LA FLEUR 3,064,370

CANAL DREDGE

Filed April 29, 1960 3 Sheets-Sheet 1

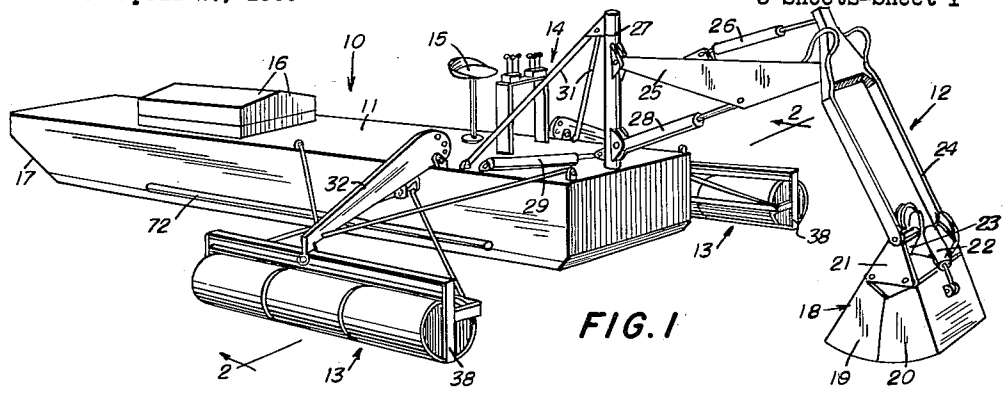


FIG. 1

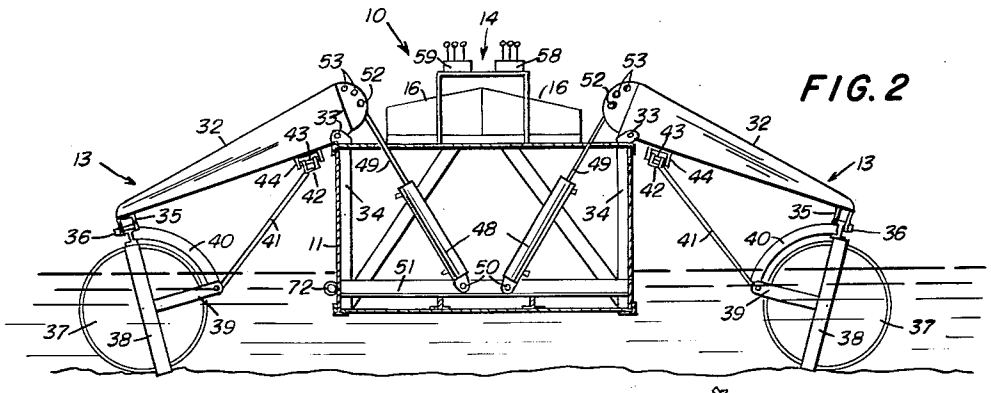


FIG. 2

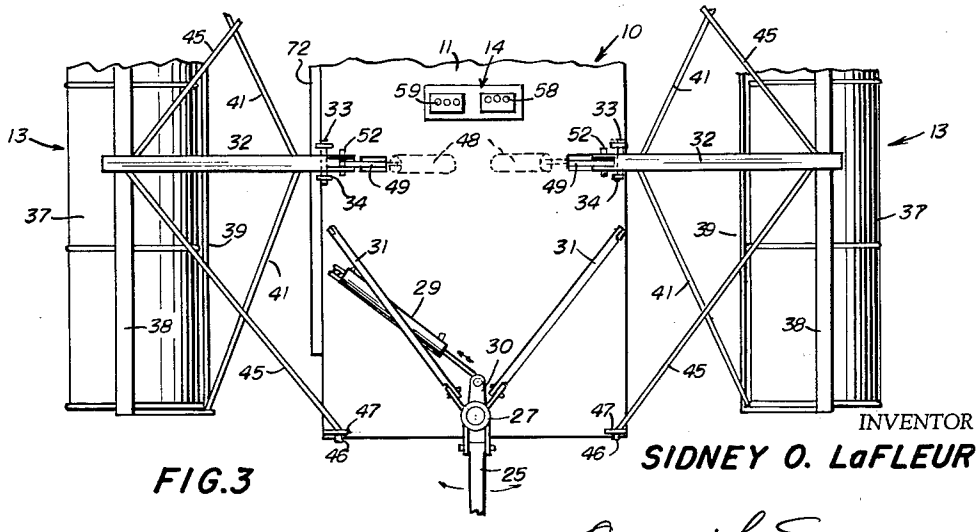


FIG. 3

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CANAL DREDGE

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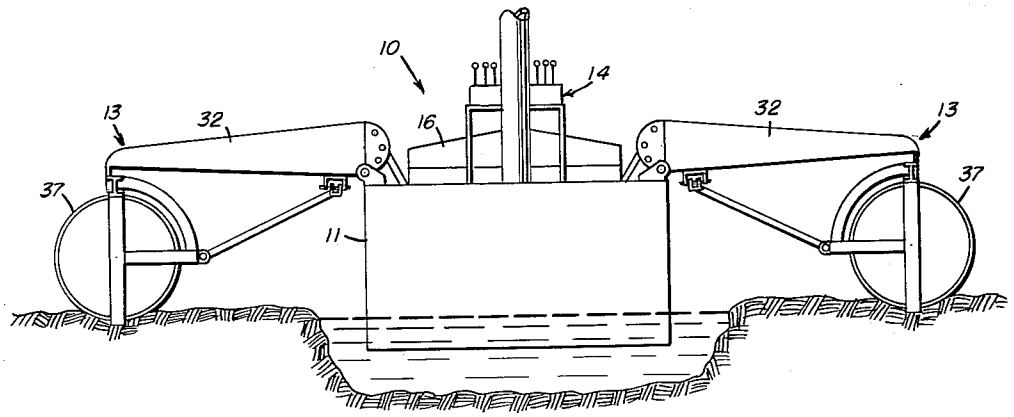


FIG. 4

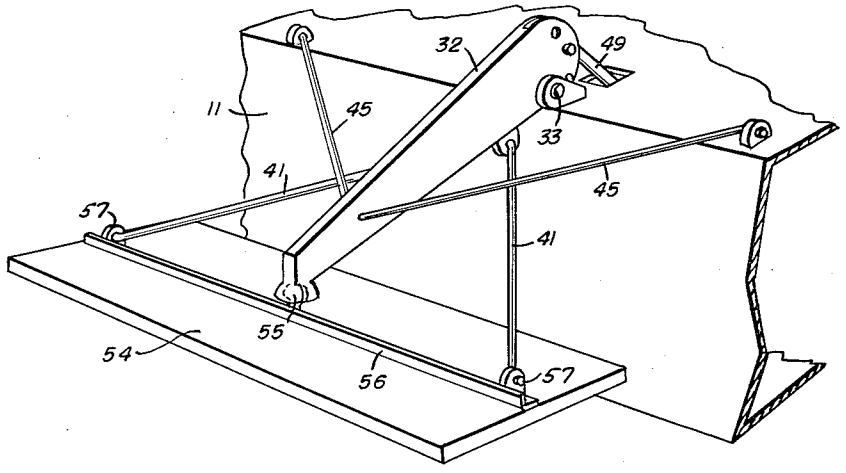


FIG. 5

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CANAL DREDGE

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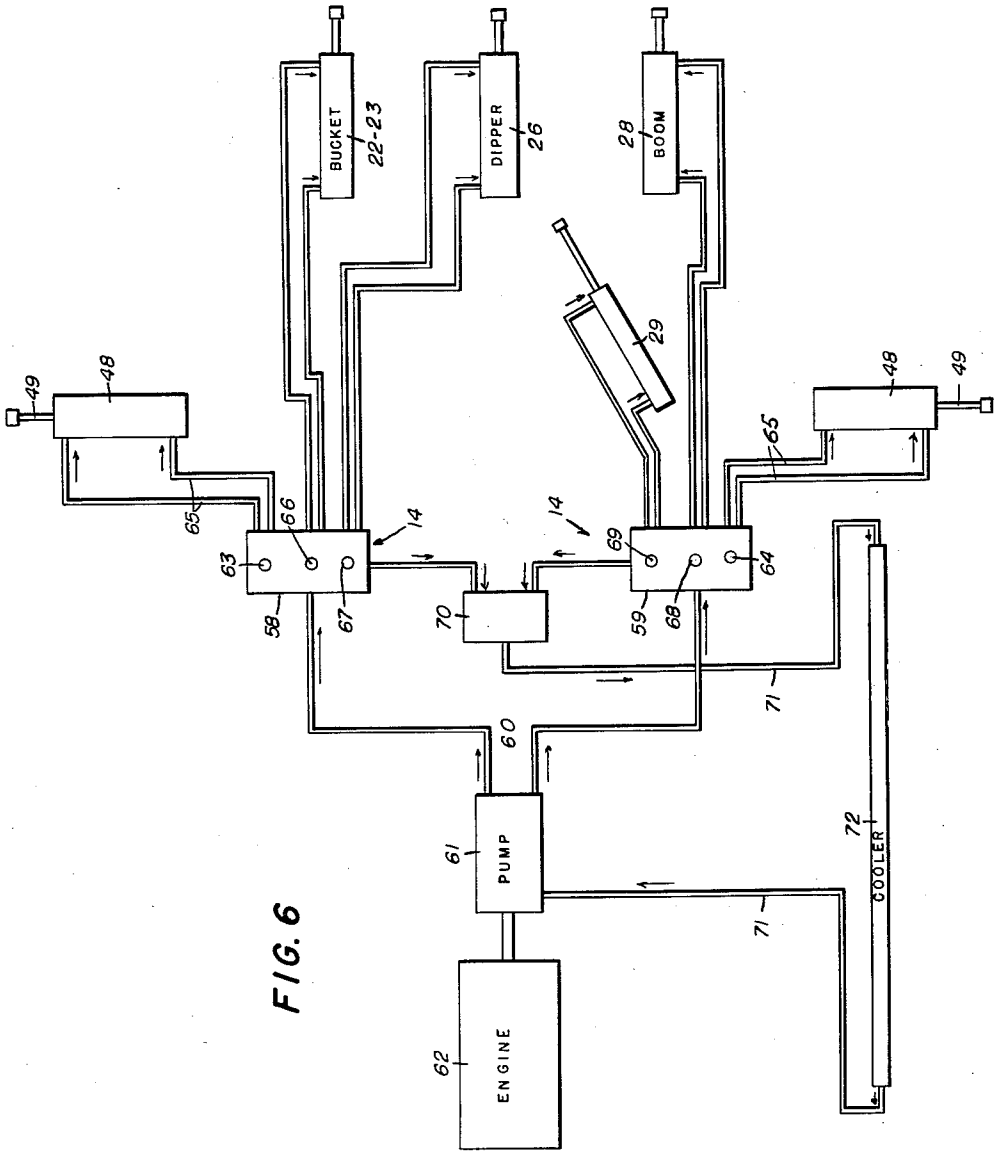


FIG. 6

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3,064,370

Patented Nov. 20, 1962

3,064,370

CANAL DREDGE

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Filed Apr. 29, 1960, Ser. No. 25,656
5 Claims. (Cl. 37—71)

This invention relates to dredges and more particularly to that class of dredges used for excavating canals and channels.

There has been a long recognized need in the art of dredging marsh trails, canals and channels, etc., for a relatively small, extremely mobile dredge which can be powered and operated by modern equipment. Heretofore, most dredges have been large structures which were outdated in design, cumbersome to operate and expensive to construct and maintain. They were not economical except on very large dredging projects. The development of canal dredging equipment has not maintained a pace with other areas in the excavating art.

Therefore, it is an object of the present invention to provide a novel canal dredge which is relatively small, extremely mobile and which can be economically operated by modern equipment.

Another object of this invention is the provision of a canal dredge having a relatively narrow hull thereby necessitating only the excavation of a correspondingly narrow canal or channel for passage therethrough.

Still another object of the present invention is the provision of a dredge of the above nature which has a hydraulically operated bucket excavating mechanism.

A further object of this invention is the provision of a canal dredge which is primarily stabilized by novel hydraulically operated spuds.

Still another object of the instant invention is the provision of a canal dredge which can be used in relatively small spaces and which can be operated by one person.

A further object of this invention is the provision of a dredge which can be easily and quickly "spudded" to the bank of a channel or stabilized in a body of water.

A still further object of this invention is the provision of a canal dredge which can be easily transported between work sites by a semi-trailer or like vehicle.

A further object is the provision of a canal dredge having self-contained hydraulic power means which can move the dredge along the canal or channel as the work progresses by actuating the excavating mechanism and spud devices.

An even further object is the provision of the dredge which is adapted to float in shallow water. These and other objects and advantages of the invention will become apparent from the following specification and drawings wherein like numerals refer to similar parts throughout.

In the drawings:

FIG. 1 is a perspective view of the novel canal dredge;

FIG. 2 is a sectional view taken along the lines 2—2 of FIG. 1 showing details of the spud operating mechanism;

FIG. 3 is a top view of the forward portion of the canal dredge;

FIG. 4 is an end elevation of the canal dredge;

FIG. 5 is a perspective view showing a modification of the spud equipment, and;

FIG. 6 is a schematic diagram of the hydraulic system for operating the apparatus.

The embodiment of the invention shown herein comprises, generally, a relatively narrow hull having an engine and hydraulical pump driven thereby disposed within its after portion. A hydraulically operated clamshell bucket excavating mechanism is mounted on the forward portion of the hull. Hydraulically operated spuds or hull stabilizers are pivotally attached to each side of the hull. The dredge equipment is adapted to be operated by one person from a control panel located on the deck of the hull.

Referring to the drawings and more particularly to FIG. 1, it is seen that the complete canal dredge, generally designated as **10**, comprises a relatively narrow hull **11**, excavating mechanism **12** and a pair of oppositely disposed spuds or stabilizing devices **13**. The hull is constructed of light sheet metal welded to a structural steel framework. A control panel **14** which will be referred to in greater detail herein is mounted on the forward portion of the deck of the hull. An operator's seat **15** is disposed on the hull deck aft of the control panel **14**. Access doors **16** are provided in the rear portion of the hull deck for exposing the internal combustion engine, hydraulic pump and related accessories for maintenance purposes. The stern of the hull **11** is bevelled at **17** to reduce its resistance when the same is being towed through the water to location at a particular excavation site.

The forwardly disposed excavating mechanism **12** which, of itself, forms no part of the present invention includes a clamshell bucket **18** comprising a pair of cooperating sections or jaws **19** and **20**. These jaws are pivotally attached to a center section **21** and are actuated by a pair of double acting hydraulic cylinders **22** and **23**. The center section **21** is in turn swingably mounted on the outer end of a frame **24**. This frame is pivotally attached for swinging movement in a vertical plane at a point intermediate its ends to the boom member **25**. A hydraulic cylinder **26** imparts swinging movement to the frame **24** about its point of pivotal attachment to the boom **25**. The generally horizontally disposed boom member **25** has its other end pivotally connected to the vertically disposed standard **27**. Another hydraulic cylinder **28** causes the boom **25** to rotate about a horizontal axis through its pivot point with the standard **27**. The entire excavating mechanism including the standard **27** is adapted for limited rotation about a vertical axis extending through the center of the standard. This rotary movement is imparted by the double acting cylinder **29**. The cylinder **29** is pivotally anchored to the deck of the hull at one of its ends and pivotally connected at its other end to a bell-crank member **30** which is rigidly secured to the standard **27**. The standard **27** is braced in its vertical position on the deck of the hull **11** by a pair of inclined rods **31**. All of the fluid cylinders **22**, **23**, **26**, **28** and **29** are supplied with fluid pressure at both ends thereof through the medium of flexible hoses and other conduits which are shown schematically in FIG. 6. The entire excavating mechanism **12** can be easily manipulated for rapid digging by a single operator stationed at the control panel **14**. The type bucket used is ideal for a floating support as described herein, since it does not transmit horizontal reactions to the dredge hull.

Referring again to the drawings and more particularly to FIGS. 2 and 3 it will be seen that the novel spuds or hull stabilizing devices **13** of the present invention generally include an outrigger member having a float tank secured to its outer end. The spuds **13** are oppositely disposed on each side of the forward portion of the hull **11** and they are identical in size and construction. One spud will be described herein, it being understood that the description applies equally to both devices.

As best seen in FIG. 2, a fabricated structural steel outrigger arm **32** is pivotally attached to a point intermediate its ends to the gunwale of the hull **11** at a trunnion **33**. The trunnion **33** is in turn supported by a vertical bracket **34** rigidly attached to the inside of the hull. The outer end of the outrigger arm **32** has a bracket **35** rigidly secured thereto. The bracket **35** supports a pin **36** which

provides for pivotal attachment of the hollow metal float tank 37. The cylindrical tank 37 has a cradle-like supporting framework welded to its exterior adapting it for attachmenet to the outrigger arm 32. The framework comprises a rectangular frame 38 and a side frame member 39 secured at right angles thereto. The two frames are welded to each other and engage one half of the tank 37 with respect to the longitudinal axis of the same. The frames are constructed of structural steel bars with the exception of the upper side of the frame 38 which is preferably a light I-beam member. This side of the frame 38 has a hole in its center portion adapted to receive the pin 36 of the bracket 35. Additional bracing at the point of pivotal attachment is provided by the arcuate member 40 which has each of its ends secured to the mid-portion of the frames 38 and 39, respectively. The longitudinal axis of the tank 37 is maintained in perpendicular relationship to the outrigger arm 32 by a pair of inclined brace rods 41. One end of the rods 41 is attached to the corners of the frame 39. The other end of the rods 41 is pivotally secured to the under side of the outrigger arm 32 by the bracket 42 and pin 43. The pin 43 is held in place by another bracket or clamp 44 rigidly attached to the arm 32. By this arrangement the tank 37 is securely attached to the arm 32 and adapted for partial rotation in a plane perpendicular to an axis extending through the pins 36 and 43. This connection permits the tank to conform to the slope of the channel or canal bed. The transversely extending outrigger arm 32 is braced by a second pair of inclined rods 45. The rods have one of their ends attached to the outer portion of the arm 32 and their other end pivotally connected by a pin 46 to an ear 47 on the hull 11. All ends of the rods 41 and 45 may be attached by pin connections so that the entire spud assembly can be easily disassambled when it is desired to transport the dredge on a trailer or similar vehicle.

Actuating means for swinging the spud 13 in a vertical plane about the trunnion 33 comprise the double-acting hydraulic cylinder 48 having the piston rod 49. The cylinder 48 is pivotally secured by a pin 50 to one of the structural steel members 51 of the hull 11. The free end of the piston rod 49 is adapted for pivotal attachment by a pin 52 to one of the sets of holes 53 disposed in the inner end of the arm 32. The sets of holes 53 permit adjustment between the piston rod 49 and the arm 32 and facilitate making the connection between these two members. Each end of the cylinder 48 is connected to hydraulic lines as shown schematically in FIG. 6.

It will be understood that the cylinders 48 are capable of swinging the surface contacting portions of the tanks 37 to a position lower than the bottom of the hull 11. In like manner the tanks 37 can be swung upwardly to a retracted position where they will be well clear of the surface of the bank of the canal or channel.

FIG. 5 shows a modification of the spuds 13 wherein the tank 37 is replaced by a generally rectangular steel mat 54. The mat is pivotally attached to the outer end of the outrigger arm 32 by a ball and socket connection 55. A longitudinally extending beam 56 reinforces the mat 54 and supports the same at its point of connection to the outer end of the outrigger arm 32. The inclined brace rods 41 are similarly attached as described above with the exception that their outer ends are pivotally secured as at 57 to the beam 56 in a manner to permit rotation of this beam about a longitudinal axis. Thus, the mat 54 is adapted for limited rotation about a transverse axis extending through the socket 55 and a longitudinal axis extending through the socket 55 and pivot connections 57. By this arrangement the mats 54 are permitted to conform to the various slopes of the canal or channel bed.

The hydraulic control system for the spuds and excavating mechanism comprises the arrangement illustrated schematically in FIG. 6 wherein 14 indicates a control panel having the two sections 58 and 59 mounted thereon. A pair of conduits 60 connect the hydraulic pump 61 with the control sections 58 and 59. The pump 61 is driven by an internal combustion engine 62 which can be operated by appropriate controls from the panel 14. Hand controls for operating the spuds 13 include a pair of vertically disposed levers 63 and 64 mounted on the control sections 58 and 59, respectively. Manual movement of the levers 63 and 64, forwardly or rearwardly, directs the flow of hydraulic fluid through the conduits 65 to the appropriate end of the double acting cylinders 48. Thus, movement of the levers 63 and 64 forwardly, for example, produces swinging motion of the spuds 13 in an upward direction while movement of the levers rearwardly would cause the spuds to swing in a downward direction.

Operation of the excavating mechanism 12 is accomplished in the same manner. Hand lever 66 is connected by appropriate conduits to the bucket jaw actuating cylinders 22 and 23. Similarly, levers 67, 68 and 69 are connected by suitable conduits to the hydraulic cylinders 26, 28, and 29, resepectively. Indicia located on the control sections 58 and 59 indicates the components of the dredge to be operated by movement of the various hand levers.

A header pipe 70 receives the return flow of hydraulic fluid from the control sections 58 and 59. A conduit 71 returns the fluid through a cooler pipe 72 to the hydraulic pump 61. The cooling action for the returning fluid is accomplished by merely locating the pipe 72 on the outside of the hull 11 at a position that will be covered by water when the dredge is in operation.

From the foregoing description it will be understood that manual movement of the levers at the control panel 14 hydraulically operates the entire excavating mechanism 12 and spud devices 13. By the arrangement of controls a single operator seated at the stool 15 has complete command of all operating components of the canal dredge.

The operation and use of the canal dredge is as follows:

As stated herein, the canal dredge is best adapted for the excavation of marsh trails, canals or channels, although it may perform other dredging operations. The dredge can be easily transported on land or water to the desired work site. The entire canal dredge has been transported on the highways by a conventional semi-trailer truck. The length of the hull 11 plus the length of the excavating mechanism when the frame 24 is disposed in the rear vertical position is slightly less than the overall length of the trailer bed. The spuds 13 can be easily and quickly disassembled by means of the pinned connections and stored along one side of the dredge hull on the trailer bed. In many instances it may be desired to tow the dredge on the surface of the water from one site to another. The dredge can be readily adapted for this mode of movement by securing the excavating mechanism 12 by appropriate means to the bow of the hull 11. The spuds 13 can be secured in a retracted position clear of the water level or they may be permitted to float on the surface. The bevelled face 17 at the stern of the hull 11 decreases the resistance of the same as it is pulled rearwardly through the water by any suitable towing vessel.

When the canal dredge is located at the work site and completely assembled, the operator starts the internal combustion engine 62 thereby supplying hydraulic pressure by the pump 61 to the various operating components of the apparatus. The excavating mechanism 12 is capable of rapid digging over a wide area forward of the hull 11. The narrowness and shallow draft of the hull 11 necessitate only the digging of a correspondingly small canal or channel for permitting passage of the hull therethrough. The downward force exerted on the forward portion of the hull by the digging action of the mechanism 12 and the rolling force about the longitudinal axis of the hull exerted when the bucket 18 is swung to one side or to the other is resisted primarily by the stabilizing

spuds 13. The outrigger arms 32 of the instant invention have a length (from outer end to pivot point) which is approximately three fourths the width of the dredge hull. This feature accounts for effective stabilizing of the canal dredge. Thus, the novel spud devices permit the utilization of a relatively narrow hull, which has the advantage as stated above, and still provide a stable platform for the excavating mechanism. Of course, the buoyant effect of the hull 11 assists to resist these forces, but this effect itself would be insufficient to maintain the hull in a rear horizontal position during most digging operations. During normal canal excavating operations, which is usually in shallow marsh land, the spuds 13 stabilize the hull by engaging the surface of the channel or canal bank. Effective spudding is provided on a variety of bank surface conditions when the tanks 37 are secured to the outriggers 32. The tanks 37 present a relatively large surface contacting area and firmly engage the surface of the bank which may be hard or soft and swampy in nature. The pivotal attachment of the tanks permits them to conform to the slope of the bank surface. If the banks near the channel or canal are extremely wet and soft and the tanks 37 cannot be pushed down to more solid terrain, the buoyant effect of the hollow tanks plays an important part in stabilizing the hull by providing a support for the outrigger arm 32. If the entire hull is surrounded by water, which may be the case when the dredge is commencing the excavation of a canal from the edge of a body of water, the buoyant effect of the tanks 37 by itself provides an adequate force for stabilizing the hull. Thus, these novel spuds give the canal dredge great utility in permitting it to effectively operate on a variety of surface conditions.

From the foregoing it will be apparent that the operator controls the digging and the stabilizing of the dredge from the control panel 14. Appropriate movement of the hand levers 66, 67, 68 and 69 controls the hydraulically actuated excavating mechanism 12. Downward and rolling forces from the bucket 18 are resisted by the hydraulically actuated spuds 13 which are controlled by movement of the levers 63 and 64. The canal dredge is also moved along the canal as the work progresses by operation of the mechanism 12 and spuds 13. This is accomplished by swinging the tanks 37 upwardly clear of the canal bank. The bucket 18 is manipulated to bite into the earth surface forwardly and centrally of the hull 11. Appropriate operation of the cylinder 26 will then pull the dredge towards the anchored bucket. The spuds 13 are swung downwardly into engagement with the canal bank and the mechanism 12 continues excavating the new area forward of the dredge.

In some instance the terrain may be such that it is desirable to substitute the mats 54 for the tanks 37. The steel mats 54 can be readily attached to the outrigger arm 32 and rods 41 by means of the pin connections. Operation of the spuds 13 in this embodiment is similar to that stated above.

It is apparent from the above specification that the present invention provides an effective canal dredge which is extremely mobile and which can be easily operated by one person in a variety of work sites. The novel spuds effectively stabilize the dredge on a variety of surfaces thereby providing a firm support for the excavating mechanism. It is relatively simple to construct and maintain. The subject dredge is economical to operate and it can be easily disassembled for transportation from one site to another.

It is to be understood that the embodiment shown is for the purpose of example only, in that other modifications thereof will fall within the scope of the appended claims.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent is:

I claim as my invention:

1. A canal dredge comprising, in combination, a relatively narrow hull having operator control panel means supported thereon, hydraulically actuated excavating means mounted on the forwardmost portion of said hull and adapted to be operated by said control panel means, said excavating means including a bucket adapted to be moved to and away from said hull, an engine and hydraulic pump driven thereby mounted within said hull, a hydraulically actuated spud mounted on each side of said hull near the forward portion thereof and adapted to be swung in a vertical plane transverse to the longitudinal axis of said hull to a ground engaging position, each of said spuds comprising a transversely extending outrigger pivotally attached at a point intermediate its ends to said hull and having a ground engaging member secured to its outer end, each of said outriggers having a hydraulic ram pivotally attached to the inner end thereof and pivotally anchored to said hull, hydraulic conduits disposed within said hull for operatively connecting said hydraulic rams and said pump with said operator control panel means, whereby said spuds may be swung to their ground engaging position for stabilizing said dredge during operation of said excavating means and swung away from their ground engaging position allowing said dredge to be pulled forwardly by said excavating means.

2. A canal dredge according to claim 1 wherein said ground engaging member comprises a cylindrical float tank pivotally mounted at right angles at a point intermediate its ends to said outrigger, said tank having mounting means adapting it and restricting it for limited rotation about said pivot point in a plane perpendicular to the longitudinal axis of said outrigger.

3. A canal dredge according to claim 1 wherein said ground engaging member comprises a generally rectangular mat pivotally mounted at a point near its center to said outrigger, said mat having mounting means adapting it and restricting it for limited rotation about a transverse axis intermediate its ends and for limited rotation about a longitudinal axis near its center.

4. A canal dredge according to claim 1 wherein said outrigger extends outwardly from its point of pivot for a length which is approximately three-fourths the width of said hull.

5. A canal dredge comprising, in combination, a relatively narrow hull having operator control panel means supported thereon, hydraulically actuated excavating means mounted on the forwardmost portion of said hull and adapted to be operated by said control panel means, said excavating means including a clamshell bucket adapted to be moved to and away from said hull, an engine and hydraulic pump driven thereby mounted within said hull, a hydraulically actuated spud mounted on each side of said hull near the forward portion thereof and adapted to be swung in a vertical plane transverse to the longitudinal axis of said hull to a ground engaging position, each of said spuds comprising a transversely extending outrigger pivotally attached at a point intermediate its ends to the gunwale of said hull and having a ground engaging member secured to its outer end, each of said outriggers having a hydraulic ram disposed within said hull, each of said hydraulic rams having one of its ends pivotally attached to the inner end of said outrigger and having its other end pivotally anchored to the bottom of said hull, hydraulic conduits disposed within said hull for operatively connecting said hydraulic rams and said pump with said operator control panel means, whereby said spuds may be swung to their ground engaging position for stabilizing said dredge during operation of said excavating means and swung away from their ground engaging position allowing said dredge to be pulled forwardly by said excavating means.

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