

July 21, 1970

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3,521,387

DREDGING MACHINE

Original Filed Jan. 24, 1966

2 Sheets-Sheet 1

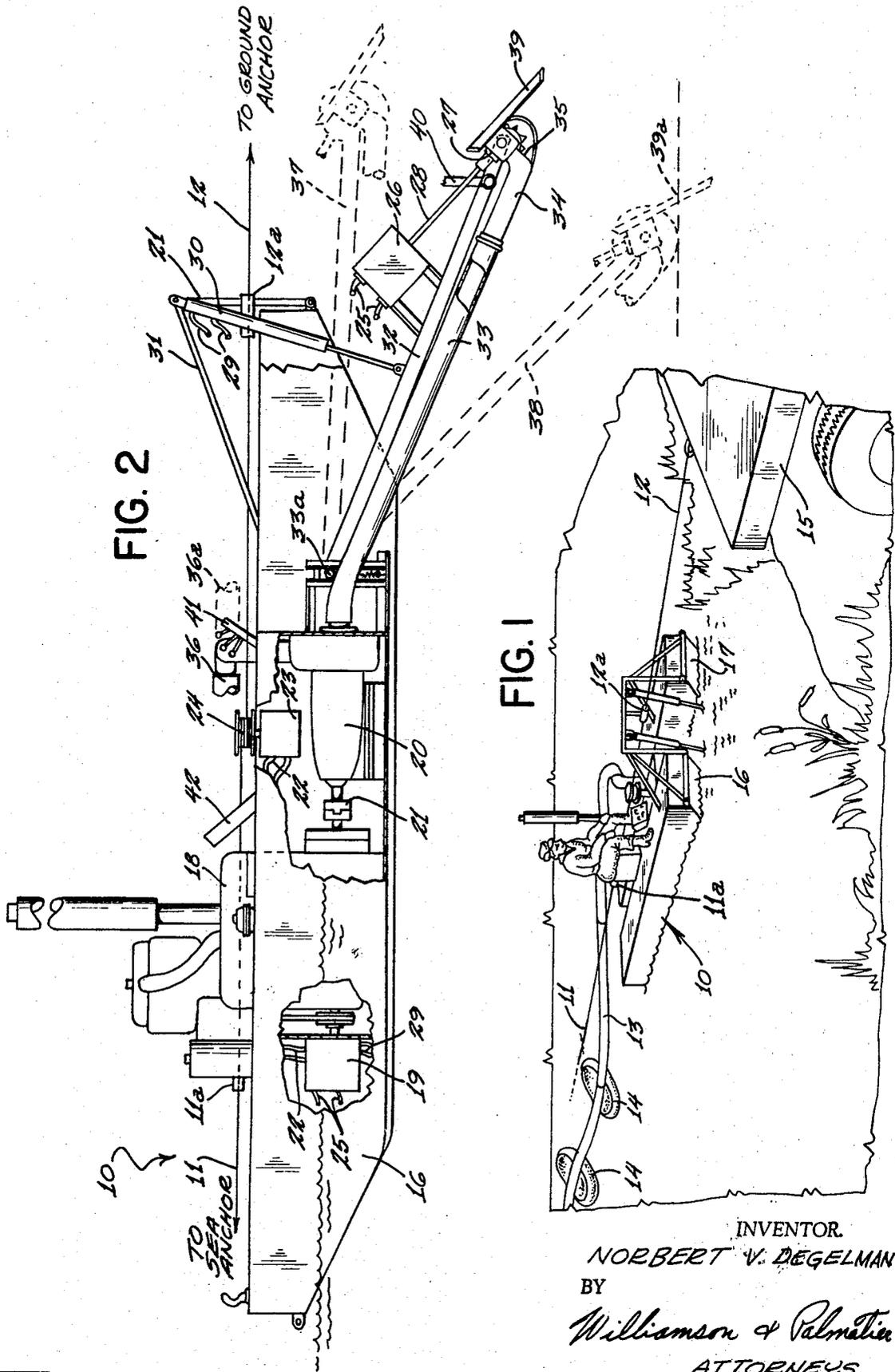


FIG. 2

FIG. 1

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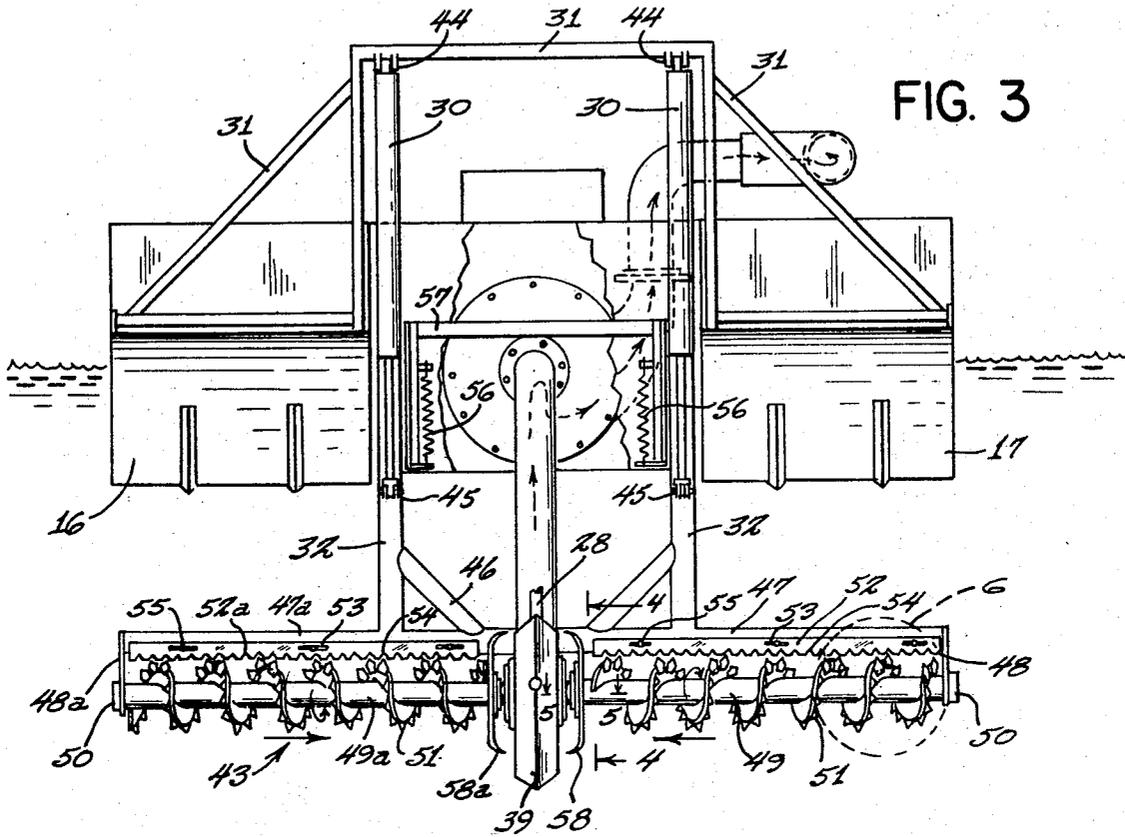


FIG. 3

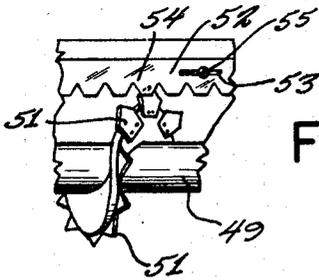


FIG. 6

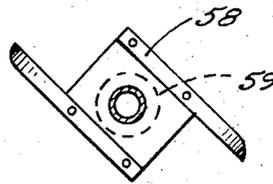


FIG. 4

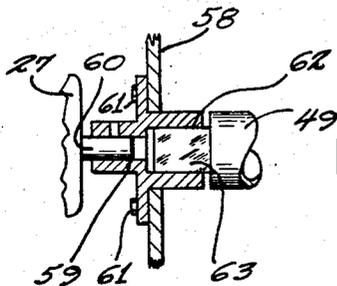


FIG. 5

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**DREDGING MACHINE**

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Continuation of application Ser. No. 522,703, Jan. 24, 1966. This application Apr. 4, 1969, Ser. No. 814,232  
Int. Cl. E02f 3/92; A01d 45/08

U.S. Cl. 37-66

1 Claim

**ABSTRACT OF THE DISCLOSURE**

A dredging machine with a forwardly projecting boom to be raised and lowered to the bottom of the body of water, the boom carrying a suction head and a pair of transversely extending augers with teeth to dig and move the dredge material inwardly toward the suction head, there being a notched plate above the augers and digging teeth to cooperate therewith in moving the dredged material. The dredge is movable in a fore and aft direction whereby to produce digging and dredging all along the length of the augers.

This application is a continuation of application Ser. No. 522,703, now abandoned.

It is oftentimes desirable to dredge areas such as like bottoms adjacent the shore line of, for example, a summer cottage or lake home. Dredging is done for two reasons, firstly to remove weeds and secondly, to remove silt. This provides an area for a bather to use without the obstruction and inconvenience presented by weeds and silt. To perform this limited operation, it should not be necessary to obtain the services of large commercially operated industrial dredging machines in that, oftentimes, the job is performed in such a small area that it is not economically feasible to retain the services of an industrial dredging machine. Further, it is oftentimes difficult and even impossible to bring an industrial dredging machine into a remote area to perform a limited operation, yet smaller commercially available dredgers are limited in their ability to properly dredge an area.

With these comments in mind it is to the elimination of these and other disadvantages to which the present invention is directed along with the inclusion therein of other novel and desirable features.

An object of my invention is to provide a new and improved dredging machine of simple and inexpensive construction and operation.

Another object of my invention is the provision of a dredging machine which is self-priming and may be transported on a truck.

Another object of my invention is the provision of a dredging machine which is capable of high production and which removes weeds as well as silt.

Another object of my invention is the provision of weed harvesting apparatus which collects the weed, shreds them and suspends them in a slurry of water for disposal through a centrally located receiver to the dredging pump and into the discharge area.

Still another object of my invention is the provision of apparatus to collect and suspend silt for disposal through a dredging pump to the discharge area.

Still another object of my invention is the provision of apparatus for safeguarding the dredging pump and harvesting apparatus from damage which could be caused by unseen obstructions laying on the surface being dredged.

Another object of my invention is the provision of an improved dredging machine with a minimum of controls, permitting operation by a person of minimum skill or manual dexterity.

These and other objects and advantages will more fully

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appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views, and in which:

FIG. 1 is a diagrammatic sketch of a typical usage of the dredging machine of my invention.

FIG. 2 is a side elevation view with breakaway views showing sub-assemblies of my invention.

FIG. 3 is a front elevation view showing the weed and silt harvesting and collecting apparatus of my invention.

FIG. 4 is an enlarged partial perspective view taken along the section line 4-4 of FIG. 3.

FIG. 5 is an enlarged partial sectional view taken along the section line 5-5 of FIG. 3.

FIG. 6 is an enlarged partial perspective view showing the detail of the weed shredding apparatus of my invention.

One form of the present invention is shown in the drawings and is described herein.

FIG. 1 shows the dredging machine in operation. The dredging machines is indicated, in general, by numeral 10 and is shown anchored lakeside with the cable indicated by 11 passing through rear guide 11a. The machine is anchored at short with the line indicated by 12 passing through guide 12a. The dredging discharge hose 13 is shown on floats 14 to discharge at a predetermined position outside of the area being dredged and generally lakeside. The dredging machine 10 is anchored at shore on a truck 15. Of course, any anchoring means may be used. The operator begins dredging in the deep water and moves toward shore to more shallow water cleaning the surface of the lake bottom in the forward motion. The operator may control the depth of the harvesting and collecting mechanism as he moves forward. The dredging machine moves forward on an hydraulically operated winch which winds cable 12 and unwinds the anchored lakeside cable 11; the operator may return the machine with the reverse operation. The dredging machine consists of floats 16 and 17 constructed of air tight, welded steel plate with a similarly constructed engine well mounted therebetween.

Referring to FIG. 2, a power source 18 is indicated and is mounted in the well between the floats 16 and 17. The power source is typically a four cylinder GM diesel engine of sufficient capacity to drive a dredging pump, two hydraulic motors, and two hydraulic cylinders. The breakaway view indicates the engine having a front power take-off connected to an hydraulic pump 19, and a rear power take-off connected to a dredging pump 20. The hydraulic pump 19 is a standard commercially available hydraulic pump of sufficient capacity to drive the hydraulic system. The dredging pump is also a commercially available unit capable of operating between 1500 and 1800 r.p.m. and of delivering 1500 gallons and 1½ cubic yards of ground per minute. The ground may be silt or weeds and is suspended in the water which is pumped by the dredging pump. The pump is coupled to power source 18 with coupling 21 which includes built-in torque safeguards. A pair of hydraulic lines 22 connect the pump 19 with hydraulic motor 23, supplying power to the hydraulic motor. This is a reversible motor and operates a winch 24 which reels cables 11 and 12 in response to manipulations of controls by the operator. A second pair of hydraulic lines 25 joins pump 19 with reversible hydraulic motor 26 which in turn connects with a gear box 27 through line shaft 28 to drive the weed and silt harvesting and collecting apparatus. Hydraulic motors 23 and 26 are commercially available and are reversible to prevent damage to the hydraulic motors, to the pump 19 or to the power source 18 in the event of obstructions at the harvesting apparatus or other mechanical failure in the power train. A third set of hydraulic lines is indicated by numeral 29 and con-

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nect the hydraulic pump 19 with a pair of hydraulic pistons 30 which are single acting pistons for raising and lowering the harvesting boom. The hydraulic pistons 30 are commercially available and are pivotally mounted on frame 31 which is constructed of suitable rigid steel members and is attached to floats 16 and 17.

A breakaway view in FIG. 2 shows the assembly of the hydraulic cylinders to the harvesting boom 32 which pivots at fulcrum 33 which comprises a cross member securely attached to floats 16 and 17 providing an axis of rotation for boom 32 transverse to the direction of travel of the dredging machine. The boom 32 is constructed of rigid material such as approximately 6 inch diameter steel tubing and joins fulcrum 33a with gear box 27. A flexible suction hose 33, constructed from approximately 6 inch diameter reinforced rubber tubing interconnects the dredging pump 20 with ground engaging weed and slit receiving member 34. Weed and slit receiving member 34 is constructed from rigid pipe of approximately 6 inch diameter and is adapted to receive on one end the suction hose 33 and on the ground engaging end includes an aperture 35 to receive the suspended shredded weeds and suspended silt. Gear box 27 is mounted on member 34 upwardly of the receiving aperture 35. A slit and weed discharge is indicated at 36, with an alternate position 36a indicated by the dotted lines. The discharge hose is connected to the discharge side of pump 20 and is constructed of material similar to the material of the suction hose 33 and of substantially equal diameter. Alternate positions of the harvesting boom 32 are shown in the dotted lines of FIG. 2. Upper transport position is indicated at 37; the ground engaging harvesting position indicated at 38. A rock guard or rigid stone deflector 39 is shown and guards against rocks entering opening 35 and also, as indicated in the dotted lines of boom position 38, engages the lake bed which is being dredged to turn up any undesirable material immediately forwardly of aperture 35 and push it aside to avoid interference with aperture 35.

A depth gauge 40 is shown in part and allows the operator to determine the depth of the boom 32. A control console for the hydraulic system is indicated at 41. An additional control panel is indicated at 42 for the master controls to the pump 19 and the power source 18.

Referring to FIG. 3, the harvesting mechanism of my invention is shown and is indicated in general by numeral 43. Framework 31 is shown attached to floats 16 and 17 and includes rigid members and cross members to support pivotally attached pistons 30. The pistons are pivotally attached to the framework 31 at pivot point 44 at the upper end with the end of the piston ram attached to the harvesting boom members 32 at pivot points 45. Suitable boom bracing 46 is included at the point of attachment of the harvesting boom members 32 to the transverse member 47 which supports the harvesting and collecting apparatus. The harvesting boom and cross members, as well as the transverse supporting member, are constructed from suitable rigid material such as 6 inch diameter steel piping welded to the transverse member which is constructed from rigid steel plate stock. Depending supports 48 and 48a are affixed to the outer edge of transverse member 47 and extend downwardly to receive screw conveyor portions 49 and 49a respectively. Water-sealed bearings 50 and 50a are attached to depending flanges 48 and 48a to receive and support screw conveyors 49 and 49a. The screw conveyors are typically helically wound commercially available screw conveyors with a diameter of approximately 9 inches mounted on a pipe having a diameter of about 3 inches. A plurality of shredding elements 51 are attached to the outside edges of the helical portion of each conveyor 49 49a. A transverse stationary mating surface adapted to cooperate with the shredding elements 51 is attached to transverse member 47 and is indicated by numerals 52 and 52a. Slots 53 respectively provide transverse adjustment for the mating members to properly align grooves 54 with teeth or shredding elements 51.

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After the location has been determined screws 55 may be tightened securing the transverse mating members 52 and 52a to the transverse member 47.

FIG. 3 shows the stabilizing assembly for the harvesting boom providing a relatively horizontal position for the harvesting assembly at such times as the floats 16 and 17 may be disturbed by, for example, waves or the wake of a passing boat. Further disturbance may come from the unseen, uneven terrain being dredged. Motion absorbing springs 56 are shown attached to, at the lower end of the spring, supporting framework extending from floats 16 and 17 respectively. The upper end of the motion absorbing spring 56 are attached to the fulcrums or pivots 33 of each of the booms 32. The framework 57 which provides the mounting for fulcrums or pivots 33 for the harvesting boom members 32 is adapted to slidably mount the pivots to provide a safeguard against disturbance to the machine.

FIG. 3 shows reversible guard 39 mounted forwardly of the gear box 27 and attached thereon covering and protecting gear box 27 and preventing large boulders from entering aperture 35. Guard 39 is shaped as a plow with a sharp digging edge at each end adapted to engage the bed being dredged to prevent large boulders from entering the aperture 35. The screw conveyors rotate in the direction indicated by the arrows at a speed of 400-600 r.p.m., directing suspended shredded weeds and silt inwardly to aperture 35. The gear box drive shaft 28 is shown, but for clarity the hydraulic motor and depth gauge are not shown in this figure. Roto-tillers 58 and 58a rotate at 400-600 r.p.m. and are mounted on the output shafts of gear box 27. The roto-tillers operate to aid in suspending the weeds and silt in the water at the point of entry into opening 35 thereby providing more efficient usage of the dredging pump 20. Further, the roto-tillers aid in a final shredding of any long weeds which may tend to log or hamper the operation of dredging pump 20.

FIG. 4 shows a roto-tiller blade mounted on a rigid cast adapter which attaches and is set-screwed and keyed to the output shaft of the gear box. As shown in FIG. 5, the adapter is indicated by 59 attached to the gear box output shaft 60. The roto-tiller 58 comprises a pair of rigid arms and is bolted to the adapter 59 with shear bolts 61. Adapter 59 has a square socket 62 adapted to receive a mating square shaft 63 which is inserted into screw conveyor pipe 49 or may be integral with pipe 49. The screw conveyor is held in place in square socket 62 by bearing 50. Screw conveyor 49a is assembled in the same manner and is not described here. Since the hydraulic drive motor is reversible no harm will be done to the proper source of hydraulic pumps from a jam between the screw conveyor and the shredding assembly.

As shown in FIG. 6, a portion of the harvesting assembly is shown indicating the mating between the shredder elements 51 and the stationary mating member 52. Shredder elements 51 grip the weeds conveying them against slots 54 providing a scissor-like shearing action, cutting the weeds into shreds which may be suspended in water which is pumped by the dredging pump 20. Transverse slots 53 are shown and provide transverse adjustment to the member 52 so that proper cooperation may be obtained between shredding elements 51 and slots 54. A tightening screw 55 is also shown.

#### OPERATION

The dredging machine may be transported by truck to the area to be dredged. The unit is placed in the water at the outer edge of the area to be dredged. An anchor is dropped with cable 11 attached thereto. A ground or shore anchor is also secured, typically to the truck, and cable 12 attached thereto. The power source 18 is started simultaneously supplying power to the hydraulic pump, the hydraulic motors and the hydraulic piston. To operate the unit the operator lowers the harvesting boom to the

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desired dredging depth. The hydraulic motor for the winch is then set at the desired speed and the dredging machine is winched toward shore with the harvesting boom preceding the unit. The harvesting apparatus is approximately 8 ft. wide. The unit may, of course, be made wider by extending the screw conveyors, and the dredging depth deeper by extending the boom and suction hose.

The dredging is done in two passes. The unit is winched shoreward removing weeds and is then returned lakeside for a subsequent traverse removing silt. The operator continues the two step traverse, moving the shore anchor after each two-step traverse. The weeds are shredded by the action of the conveyor shredding elements 51 against slots 54 which are included in traverse members 52 and 52a. The shredded weeds are conveyed inwardly toward the opening 35 by the screw conveyors. The roto-tillers, located on each side of the opening 35 rotate and suspend the shredded weeds in the water surrounding the opening 35. Pump 20 pulls the slurry through opening 35, through the pump and then pushes the slurry to the discharge pile. The pump moves the suspended weeds and the water at the rate of approximately 1500 gallons and 1½ cubic yards of weeds per minute. The discharge of pump 20 is generally located to the side or in deeper water but may, of course, be directed onto shore. The discharge hose is placed on floats 14 for easy handling.

After the initial pass of the two step traverse has been made removing the weeds, the unit is winched lakeside with the harvesting boom in the raised position. The hydraulic cylinder 30 is actuated to adjust the harvesting boom 32 to control the depth of the harvesting mechanism. The second pass is carried out in the same manner as the first pass and removes the silt. Silt is placed in suspension by the action of the conveyor which moves the silt inwardly and by the roto-tiler which suspends the silt prior to entering the opening 35.

As the dredging operation proceeds from deep water toward the shore the depth gauge will indicate to the operator the depth that he is at. He may hydraulically raise or lower the harvesting boom at the control console 41 to control the contour of the lake bottom. An operator may contour a gently sloping lake bottom or a steep grade as desired.

Rock guard 39 prevents large rocks, which the operator may not see, from entering the suction opening 35 and, as a further safeguard, the hydraulic motor 26 which drives gear box 27 is reversible in the event that the screw conveyor becomes jammed. If the conveyor becomes jammed the harvesting boom may be raised and the unit winched shoreward and cleaned. As the unit proceeds forwardly, the operator may not perceive abrupt changes in the contour of the lake bottom. Absorbing elements 56 provide a safety factor to compensate for any unseen changes in elevation which may otherwise disrupt or interrupt the efficient continuous process provided by the dredging machine of my invention.

Upon completion of the desired number of traverses, the boom may be raised to the transport position and the unit loaded onto the truck for easy transport to another jobsite.

What I claim is:

1. A dredging machine adapted to dredge and remove weeds, silt, and like material from the bottom of a body of water, comprising  
a buoyant body,

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a suction hose with a suction head to receive such material at the bottom of the body of water, pumping means on the buoyant body and connected with the hose to draw such material therethrough, a source of power with means propelling the buoyant body in forward and rearward directions and also including means restraining said buoyant body against side-to-side movement and also against turning movement as the body is propelled in forward and rearward directions,

a boom on the buoyant body and extending forwardly therefrom and supporting the suction head of the hose,

said boom being adjustable to permit vertical adjustment of the suction head according to the grade of the bottom, and said boom being immovable in a side-to-side direction whereby to restrain the suction head against side-to-side movement,

a pair of aligned and rigidly interconnected digging and conveying screw augers of uniform diameter all along their lengths and having digging teeth projecting radially from the helical webs thereof to produce digging of the material to be dredged simultaneously along the entire length of the screw augers, said screw augers being mounted on the boom and extending horizontally and transversely of said forward direction and outwardly from the suction head, and the helical webs of the screw augers respectively spiraling in opposite directions whereby as the buoyant body is propelled forwardly, each screw auger simultaneously digs all along its length and propels the material being dredged toward the suction head while the screw augers and suction head are restrained against side-to-side movement, and

a pair of elongate and generally upright plates each extending along the entire length of each respective screw auger and positioned above the auger and cooperating to confine the dredged material forwardly of the screw auger for conveying to the suction head, and

said plate having a plurality of notches along the lower edge thereof to receive the teeth as the screw auger is revolved, whereby to cut and shred weeds encountered in the dredging operation.

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U.S. Cl. X.R.

37—72, 115, 189; 56—9

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