Nov. 7, 1967 A. J. NELSON 3,350,798

CONDITION RESPONSIVE ELEVATOR DREDGE

Filed Jan. 13, 1965 3 Sheets-Sheet 1

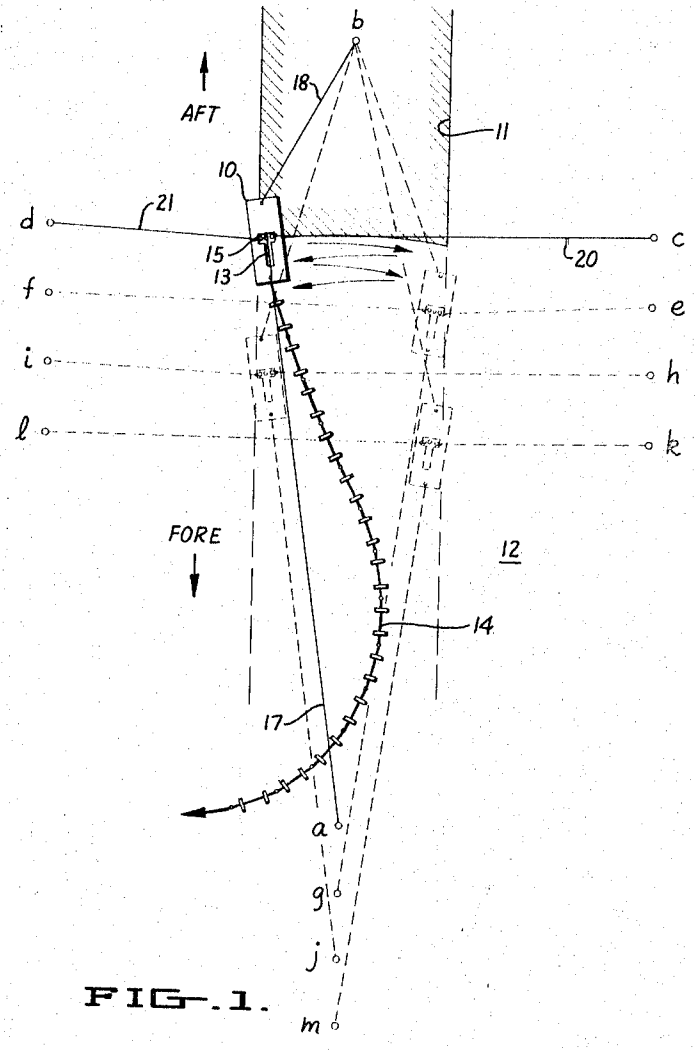


FIG. 1.

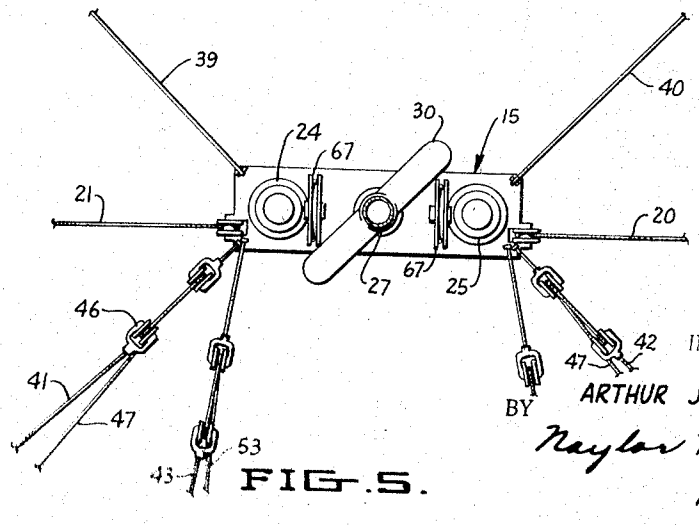


FIG. 5.

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CONDITION RESPONSIVE ELEVATOR DREDGE

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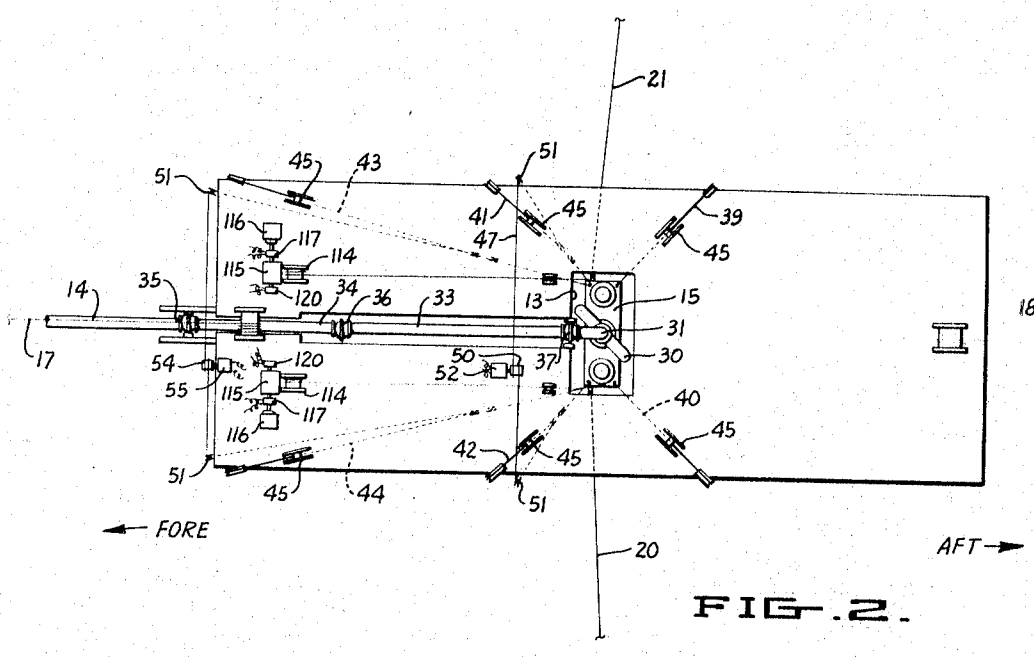


FIG. 2.

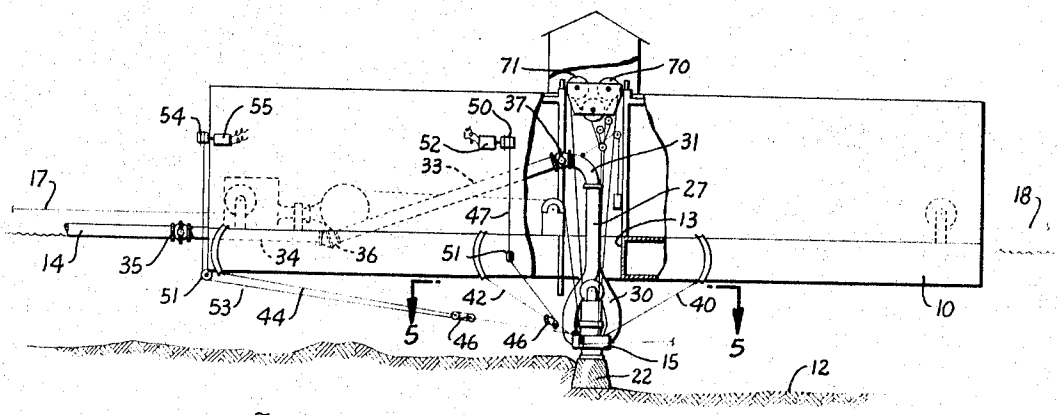


FIG. 3.

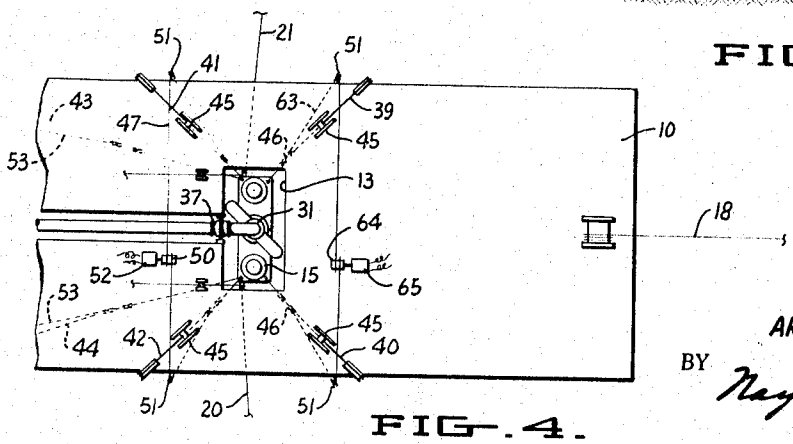


FIG. 4.

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CONDITION RESPONSIVE ELEVATOR DREDGE

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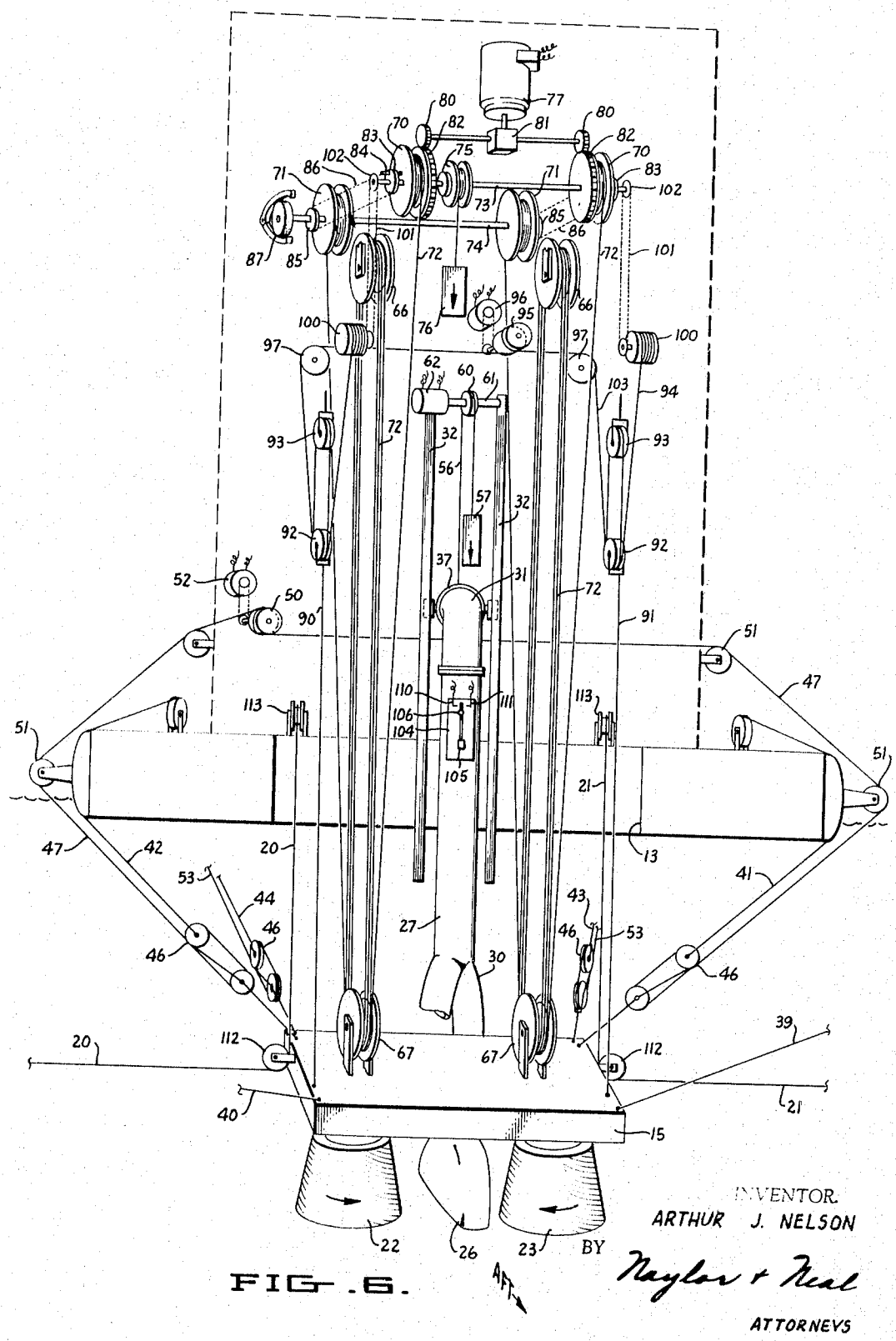


FIG. 6.

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CONDITION RESPONSIVE ELEVATOR DREDGE

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Filed Jan. 13, 1965, Ser. No. 425,256
10 Claims. (Cl. 37—65)

ABSTRACT OF THE DISCLOSURE

A condition responsive control system for incorporation into a dredging apparatus employing a buoyant station, a submerged working platform, and interconnecting elements extending between the station and platform. The latter elements comprising guy lines to maintain the platform stably beneath the station, elevator lines to effect selective raising and lowering of the platform relative to the station, swing lines to effect traversal of the platform over the floor of a body of water being worked, and equalizer lines to offset equilibrium upsetting force offered by resistance of the station to traversing movement with the platform. The system comprises monitoring apparatus to sense instantaneous fluctuations in the elevation of the station relative to the floor of a body of water being worked and misalignment between the station and platform, and control structure operable responsive to the monitoring apparatus to vary the lengths of the interconnecting elements. The monitoring apparatus and control structure function, together, to maintain a stable interrelationship between the station and platform and the floor of a body of water being worked.

The present invention relates to an elevator dredge of the type disclosed in my prior Patent No. 2,933,837, and is particularly directed to such a dredge having condition responsive control means to accommodate its use in rough water where the elevation of the dredge hull is continuously fluctuating relative to the floor of the body of water being dredged.

From my aforementioned prior patent, it can be seen that an elevator dredge is provided incorporating a platform suspended beneath a dredging hull by guy lines. The platform carries dredging cutters adapted to engage the floor of a body of water being worked and a hydraulic discharge line extends upwardly from the platform to the hull. In operation, the guy lines function to maintain the platform stably beneath the hull for any preselected depth of water being worked. It is essential that the load carrying guy lines be adjusted to such a length that they both insure engagement of the dredging cutters with the floor of the body of water being worked and, at the same time, maintain the hull stably above the platform. The adjustment of this length to accommodate rapid fluctuations in the elevation of the hull relative to the floor of the body of water being worked, as occurs in rough seas, presents a new and involved control problem.

The dredge disclosed in my aforementioned patent also includes: elevator means extending between the hull and platform to effect vertical raising and lowering of the platform; swing lines anchored to the port and starboard of the platform and associated with the platform and hull to effect port and starboard swinging of the platform; and, equalizer lines extending between the hull and platform to offset platform equilibrium upsetting forces offered by resistance of the hull to port and starboard movement. The inclusion of all of these latter elements extending between the hull and platform presents difficult length adjustment problems when the elevation of the hull relative to the floor of the body of water being worked fluctuates rapidly under rough sea conditions.

The equalizer lines referred to above are secured to the port and starboard sides of the platform and extend therefrom into engagement with selected tensioning means on the hull, which means functions to tension the lines sufficiently to offset platform equilibrium upsetting force offered by resistance of the hull to port and starboard movement. Where the hull is used in rough water, misalignment of the hull relative to the platform may result. This misalignment presents a particular problem in the control of the tensioning means for the equalizer lines.

It is, accordingly, a principal object of the present invention to provide a dredge of the type disclosed in my aforementioned patent with means to accommodate its effective operation under rough water conditions. This means functions to effectively solve the afore-numerated problems and their inherently related problems resulting from rough water operation.

It is a more specific object of this invention to provide such a means utilizing the orientational relationship between the dredging hull and the discharge line from the dredge platform to effect control of the various elements extending between the platform and hull.

The present invention may be defined as a control improvement for use in combination with a dredge of the type disclosed in my aforementioned patent. This improvement broadly comprises adjustment means for the elements extending between the hull and platform; monitoring means to continuously sense fluctuations in the instantaneous position of the hull relative to the platform at an area to be dredged on the floor of the body of water in which the hull is floating; and, means controllably associating the monitoring means with the adjustment means to operate the latter means so as to accommodate the effective operation of the elements adjusted thereby.

The details of the invention and the foregoing and other objects will become more apparent when viewed in light of the accompanying drawings, wherein:

FIG. 1 is a plan view schematically illustrating the manner and mode of operation of the dredge in relation to an area to be dredged;

FIG. 2 is a plan view schematically illustrating the hull and platform incorporating one embodiment of the present invention;

FIG. 3 is an elevational view, partially in section, schematically illustrating the hull and platform incorporating the embodiment of the invention illustrated in FIG. 2;

FIG. 4 is a plan view, partially in section, schematically illustrating an embodiment of the invention slightly modified from that shown in FIGS. 2 and 3;

FIG. 5 is a plan view, with parts thereof broken away for the sake of clarity, showing the details of the platform and elements cooperating therewith illustrated in FIGS. 2 and 3; and,

FIG. 6 is a perspective view, partially in section, diagrammatically illustrating the control arrangement for the elements extending between the hull and platform.

Referring now to FIG. 1 of the drawings, therein is illustrated a dredging hull **10** in the operation of cutting a channel **11** into the floor **12** of a body of water. The hull **10** differs from that disclosed in my aforementioned U.S. Patent No. 2,933,837 primarily in that the T-shaped well **13** extending therethrough is located with the cross portion thereof amidship, rather than to the stern end of the hull. A pontoon supported discharge line **14** extends forwardly from the hull **10** to a discharge location, such as an adjacent shoreline (not illustrated). The discharge line **14** is preferably supported by a pontoon structure as disclosed in my copending application Ser. No. 412,003, filed Nov. 18, 1964.

The hull **10** has suspended through the well **13** a dredging platform **15** corresponding to that disclosed in my aforementioned patent. This platform, as will be devel-

oped subsequently, is suspended stably below the hull so as to have the dredging cutters thereof in operative engagement with the floor 12. In operation, the platform 15 is traversed across the floor 12 as indicated by the arrow lines in FIG. 1 by swing line structure including bow and stern swing lines 17 and 18, respectively, and port and starboard swing lines 20 and 21, respectively. The bow and stern lines correspond identically to those utilized with the hull of my aforementioned patent, whereas the port and starboard swing lines may either correspond to those used with the latter hull or differ therefrom in their operation means carried by the hull 10. Specifically, the ends of the port and starboard swing lines extending to the hull 10 may either be reeved onto winches of the type disclosed in my aforementioned patent or onto winches controlled responsive to fluctuations of the hull elevation relative to the floor 12, as will be developed subsequently.

The manner and mode of operation of the dredge shown in FIG. 1 corresponds to that of my aforementioned patent. Specifically, the swing lines 17, 18, 20 and 21 are first anchored at the positions designated as *a*, *b*, *c*, and *d*, respectively, and the platform 15 is lowered to a position wherein the cutters carried thereby engage the floor 12 at a point approximately midway between the sides of the area in which it is desired to form the channel 11. Once the cutters are engaged with the floor 11, the swing lines 20 and 21 are selectively payed out and taken up to traverse the cutters across the channel area, as indicated by the arrow lines in FIG. 1. At the end of each traverse, the bow swing line 17 is shortened by a distance approximately equal to one-half the diameter of the cutters. This shortening of the bow line in step by step fashion is continued, while maintaining the initial swing line anchor points *c* and *d*, until the hull 10 reaches a position opposite the anchor points designated as *e* and *f*. At this point, the dredge is returned by the stern line 18 to its starting point. The platform is then lowered for the next increment of cut and once again the hull 10 is traversed across the channel in step by step fashion until it is midway between the points *e* and *f*. This routine is followed until the portion of the channel being worked has been dredged to the desired depth, at which point the platform is raised to the original dredging depth and the anchors for the lines 17, 20 and 21 are moved to the points *g*, *e*, and *f*, respectively, and the line 18 is lengthened to accommodate this movement. At this point, the traversing of the platform 15 is effected in the same manner used when the anchor lines 20 and 21 were anchored between the points *c* and *d* until a section of channel is completed to the desired depth to a location between the points designated as *h* and *i*. Thus, the channel 11 is formed to desired depth in step by step fashion. After the channel is completed to the location between the points *h* and *i*, the lines 20 and 21 are moved to the points designated as *k* and *l* and the line 17 is moved to the point *m*, etc. The distance between the successive port and starboard swing line anchor points and the successive bow line anchor points are chosen so as to effect the cutting of a channel with substantially uniform penetration through optimum utilization of the effort applied by the port and starboard swing lines. The particular relationship of the swing lines and their anchor points and the advantages derived therefrom are developed fully in my aforementioned patent.

The dredging structure carried by the platform 15 includes a pair of downwardly disposed rotary cutters 22 and 23 adapted to turn in the direction indicated by the arrow lines in FIG. 6. The cutters are driven by electric motors 24 and 25 (see FIG. 5) and have disposed therebetween a suction inlet 26.

The inlet 26 communicates with a vertically disposed discharge pipe 27 through means of a Y-branch connection 30. The pipe 27 is mounted against elevational movement relative to the platform 15 through its connection to the Y-branch connection 30 and extends upwardly from the platform through the well 13 and into engagement with an elbow 31 mounted for slidable movement between a pair of tracks 32 fixed to the hull 10. This arrangement corresponds substantially to that disclosed in my aforementioned Patent No. 2,933,837. The elbow 31 communicates with the pontoon supported discharge line 14 through means of pipe sections 33 and 34 carried by the hull (see FIGS. 2 and 3). The sections 33 and 34 are associated with each other and the pipeline 14 and the elbow 33 through structure corresponding to that utilized for like purposes in my aforementioned prior patent. This structure comprises ball joints 35 and 36 mounted at either end of the section 34 for horizontal slidable movement on the hull and a ball joint 37 connecting the elbow 31 and the section 33. It is through the latter ball joint that the elbow 31 is mounted between the tracks 32. The slidable mounting of the ball joints and the aligned interrelationship of the section 33 and the base of the T-shaped well 13 accommodate raising and lowering of the platform 15 relative to the hull.

Referring now to FIGS. 2, 3, 5 and 6, therein is illustrated the preferred embodiment of the structure to maintain the platform 15 stably below the hull 10 during dredging operations. This structure basically comprises: center stern guy lines 39 and 40; center bow guy lines 41 and 42; and forward bow guy lines 43 and 44. The center stern guy lines 39 and 40 are similar to the corresponding guy lines of my aforementioned patent and extend upwardly and outwardly from secured engagement with the platform 15 to cable ties 45 on the deck of the hull 10. The lines 41 and 42 extend upwardly and outwardly from the platform 15 through block and tackle connections 46 and to cable ties 45 on the deck of the hull 10. As can be seen from FIG. 6, the block and tackle connections 46 are controlled through means of a line 47 trained thereover and extending into reeved engagement with a winch 50. Pulleys 51 guide the line 47 around the hull 10 and to the winch 50. The line 47 is so engaged on the winch 50 that rotation of the winch will function to either simultaneously take up or pay out both ends of the line. The winch is driven by a selsyn controlled motor 52, the control and operation of which will be developed in detail subsequently.

The lines 43 and 44 are similar to the lines 41 and 42 in that they are secured to the platform 15 through block and tackle connections 46 and extend upwardly and outwardly therefrom to cable ties 45 on the deck of the hull 10. The block and tackle connection 46 secured to the lines 43 and 44 have trained thereover a line 53 extending upwardly and outwardly therefrom into reeved engagement with a winch 54. The line 53 is so associated with the winch 54 that turning of the winch functions to simultaneously either take up or pay out both ends of the line. The winch 54 is driven by a selsyn controlled motor 55 similar to the motor 52. At this point it is noted that all of the guy lines 39 to 44 and the lines 47 and 53 take the form of flexible cables capable of supporting only tension loads.

In operation, the guy lines 39 to 44 are utilized similarly to the corresponding guy lines in my aforementioned patent. Specifically, once the hull 10 is located and the platform 15 is lowered to operative position, the guy lines are all adjusted to a length which will establish the platform in stable relationship with respect to the hull through means of the cable ties 45. During this adjustment, the block and tackle connections 46 are maintained in inactive condition through means of the lines 47 and 53.

Once the guy lines have been adjusted as developed above, the improvement of the present invention coperating with these lines is put into operation. This improvement comprises the aforementioned block and tackle connections 46 and the winch driven control lines 47 and 53 cooperating therewith, together with monitoring and con-

trol means operatively associated with the selsyn motors 52 and 53. The monitoring means, as can be seen in FIG. 6, comprises: a chain 56 secured at one end to the ball joint 37 and at the other end to a counterweight 57; a sprocket 60 over which the chain 56 is trained; and, a shaft 61 keyed to the sprocket 60 and journaled between the tracks 32. The means controllably associating the monitoring structure with the selsyn motors 52 and 55 comprises selsyn transmitter 62 driven by the shaft 61 and an electrical control line extending between the transmitter and the selsyn receivers for the motors 52 and 55. Although the electrical control lines connecting the transmitter 62 and the receivers for the motors 52 and 55 have been broken away for the sake of clarity, it is to be understood that these are of conventional nature. These control lines and the transmitter 62 controllably associate the monitoring means with the motors 52 and 55 so that raising and lowering of the discharge pipe 27 relative to the hull 10 functions to shorten and lengthen, respectively, the lines 47 and 53. The latter lines in turn function to shorten the guy lines cooperating therewith through means of the block and tackle connections 46.

From the above, it can be seen that fluctuations in the instantaneous elevation of the hull relative to an area being dredged are continuously sensed and utilized to control the length of the guy lines 41 to 44 through the block and tackle connections 46. This control is so effected to maintain these guy lines in a condition where they are neither so slack as to permit the hull to drift from a stable position above the platform, nor so taut as to lift the platform from the area being dredged. It is to be understood that the winches 50 and 54 are of such a control pitch as to compensate for angular variances between the hull and the guy lines.

Attention is now directed to the fact that in the embodiment of the invention illustrated in FIGS. 2, 3, 5 and 6, the guy lines 39 and 40 are not provided with block and tackle connections to facilitate their condition responsive lengthening and shortening. The absence of the condition responsive connection from these lines is permissible because these lines are not loaded during normal operation of the dredging apparatus. Specifically, when the cutters 22 and 23 are in engagement with the floor of a body of water and the platform 10 is being motivated by the swing lines, only the guy lines extending to the bow of the hull are normally under tension. For this reason, it is possible to adjust the guy lines 39 and 40 to a length wherein they will not interfere with operation of the dredging apparatus as the instantaneous elevation of the hull fluctuates relative to the platform. This adjustment is necessary when the dredging apparatus is used in rough seas and is accomplished by initially adjusting the guy lines 39 and 40 to a length wherein they are taut only when the hull is at maximum elevation relative to the platform.

Referring now to FIG. 4, therein is illustrated the hull 10 provided with a guy line arrangement differing from that described with reference to FIGS. 2, 3, 5 and 6 only in that the guy lines 39 and 40 are made condition responsive in a manner similar to that used for the guy lines 41 and 42. Specifically, in this arrangement the guy lines 39 and 40 are secured to the platform 15 through block and tackle connections 46. The block and tackle connections secured to the guy lines 39 and 40 are adjustable through means of a line 63 extending therearound upwardly and outwardly over the side of the hull 10 to a winch 64 driven by a selsyn controlled motor 65. The operation of the line 63, winch 64 and motor 65 corresponds identically to that of the line 47, winch 50 and motor 52, respectively. Furthermore, the motor 65 is controlled through the selsyn transmitter 62 in a manner corresponding to that of the motor 52. Thus, with the arrangement of FIG. 4, all of the guy lines 39 through 44 are controlled in length responsive to fluctuations in elevation of the hull 10 relative to the area of the floor 12 being dredged. This arrangement, as contrasted to that described with reference to FIGS. 2, 3, 5 and 6, is desirable under conditions wherein it is found necessary to utilize the guy lines 39 and 40 to assist in the active stabilization of the platform 15. Such conditions may typically result when the apparatus is used in extremely rough seas.

Referring now to the elevator structure for raising and lowering the platform 15 relatively to the hull 10, this structure corresponds closely to that of my aforementioned patent and can be best seen from FIG. 6. The structure comprises: a pair of spaced head blocks 66 carried by the hull; a pair of tail blocks 67 secured to the platform 15 in alignment with the head blocks; a pair of haul drums 70 carried by the hull on one side of the head blocks 66; a pair of store drums 71 carried by the hull on the other side of the head blocks 66; cables 72 reeved around the opposed head and tail blocks and having the ends thereof secured to the haul and store drums on either side of the head blocks; and, drive structure to selectively actuate the haul and store drums to effect raising and lowering of the platform 15 relative to the hull. The haul and store drums 70 and 71 are keyed to shafts 73 and 74, respectively, which shafts are journaled (not illustrated) for rotational movement on the hull. Preferably the shafts 73 and 74 and the bearings for the head block 66 are all carried by a crane supported on the hull.

To secure reduction of the power demand required to drive the haul drum 70, a counterweight drum 75 is clutched to the shaft 73. This drum supports a counterweight 76 which is sufficient weight so that when the drum is engaged, the power required to drive the haul drum 70 is only equal to that required to overcome friction and inertia forces in the elevator.

The drive structure for the haul and store drums comprises: a reversible selsyn controlled motor 77; drive gears 80 driven by the motor through a gear reducer 81; driven gears 82 keyed to the shaft 73; sprockets 83 selectively engageable with the shaft 73 through clutches 84; sprockets 85 keyed to the shaft 74 and drivingly engaged with the sprockets 83 through chain 86; and, a brake 87 operable to selectively lock the shaft 74.

Normal operation of the elevator structure to effect raising and lowering of the platform 15 corresponds to that described in my aforementioned patent. Specifically, to effect an increment of lowering, a length of cable 72 is first transferred from the store drum 71 to the haul drum 70; the shaft 74 is locked; and, the length of cable is payed out from the haul drum 70. During this lowering operation, the drum 75 is preferably disengaged from the shaft 73. To effect raising of the platform 15, the reverse of this procedure is followed. During raising, the drum 75 is also preferably disengaged on the shaft 73.

Condition responsive action of the elevator structure corresponds closely to that described with reference to the guy lines. Specifically, the monitoring structure is controllably associated with a selsyn receiver for the motor 77 through means of the selsyn transmitter 62 so as to effect operation of the motor responsive to fluctuations in the instantaneous elevation of the hull. This association is established so that the segment of the cable 72 between the blocks 66 and 67 will be lengthened or shortened by an amount equal to the fluctuations in the instantaneous elevation of the hull 10 relative to the floor of the body of water being dredged. Thus, such fluctuations will function neither to slack the cables to a degree permitting their entanglement, nor to tension the cables to a degree lifting the platform 15. Only during this control is the drum 75 engaged to the shaft 73 to minimize the torque requirements of the motor 77 and thus enhance its condition responsive operation.

Equalizer cables 90 and 91 extend between the port and starboard sides, respectively, of the platform 15 and the hull carried elevator structure. These cables and the elevator structure cooperating therewith are identical both in basic construction and operation to the corresponding

elements of my aforementioned patent. The structure of the elevator cooperating with the cables 90 and 91 comprises: tail blocks 92 secured to the cables; head blocks 93 suspended from the elevator structure (not illustrated); a drum 95 driven by a reversible electric motor 96 disposed between the head blocks 93; a pair of pulleys 97 mounted on either side of the drum 95; a pair of drums 100 driven through chains 101 engaged on sprockets 102 keyed to the shaft 73; and, a cable 103 extending from a centrally reeved condition around the drum 95 over the pulleys 97 around the blocks 92 and 93 and to reeved end connections with the drums 100. Through this arrangement, when the elevator cables 72 are operated to raise and lower the platform 15, the equalizer structure is shortened and lengthened to compensate for changes in the distance between the hull and platform through means of the drums 100 and cables 94. Thus, the equalizer structure is condition responsive to fluctuations in the instantaneous elevation of the hull in the same manner as the elevator structure.

The cable 103 is reeved on the drum 95 in such a manner that rotation of the drum in one direction functions to tension the starboard equalizer line and loosen the port equalizer line, while rotation in the other direction functions to tension the port equalizer line and loosen the starboard equalizer line. Thus, as is explained in my aforementioned patent, the motor 96 may be driven to tension either one of the equalizer lines and offset the platform equilibrium upsetting force offered by resistance of the hull to swinging movement through a body of water. The control system for the motor 96 is synchronized with the port and starboard swing gear and is arranged so that during starboard swinging movement the starboard equalizer line is under tension and that during port swinging movement the port equalizer line is under tension. Ideally, the control system is arranged in the manner developed in my aforementioned patent so that the action of the equalizer lines aids in the acceleration and deceleration of the hull at the point of port and starboard swings.

The improvement of the present invention for use with the above-described equalizer construction resides in an additional system to control the motor 96 responsive to port and starboard misalignment of the hull 10 relative to the platform 15. This system is designed to return the platform and hull to port and starboard alignment upon such misalignment. The system is diagrammatically illustrated in FIG. 6 and comprises a tilt meter 104 fixed to the discharge pipe 27, which tilt meter is controllably associated with the motor 96 to selectively impart tension to either of the equalizer lines 90 and 91. Basically, the tilt meter comprises a pendulum 105 pivoted about a horizontal axis 106 for swinging movement to the port and starboard and electrical contact elements 110 and 111 on either side of the pendulum adapted to be alternatively closed and opened upon swinging of the pendulum to the starboard and port, respectively. The contact elements 110 and 111 and the electrical circuitry therefrom to the motor 96 (not illustrated) controllably associate the tilt meter 104 with the motor so as to impart additional tension to the port equalizer line when the platform 15 moves to the port relative to the hull 10, or to the starboard equalizer line when the platform moves to the starboard relative to the hull. Upon port and starboard alignment of the platform and hull, the pendulum 105 asumes a vertical position where it does not effect control of the motor 96. The exact electrical circuitry between the tilt meter 104 and the motor 96 is considered well within the province of one skilled in the art, and, accordingly, has been omitted for the sake of simplicity.

Referring now to the swing gear for selectively paying in and taking out the port and starboard swing lines 20 and 21, respectively, this gear may take either the form shown in my aforementioned patent or that shown in FIG. 2. The FIG. 2 gear has the advantage that it is provided with means to maintain port and starboard swing velocity constant as the instantaneous elevation of the hull fluctuates relative to the floor of the body of water being dredged. It is possible, however, that situations may occur where the maintenance of this velocity is not of importance. For example, where the cut being dredged is relatively shallow, or the material being dredged is relatively soft, increases or decreases in swing velocity resulting from these fluctuations will have no adverse effects. In such situations, the improved swing gear of the present invention may be omitted even when the dredging apparatus is used in rough water.

Referring now to FIGS. 2 and 6, each of the swing lines 20 and 21 runs horizontally from its anchored position over a pulley 112 carried by the platform 15 and vertically from this pulley through the well 13 over pulleys 113 carried on the deck of the hull 10. From the pulleys 113 the lines 20 and 21 extend to winches 114 mounted on the deck of the hull 10, which winches are driven through gear reducers 115. The gear reducers 115 are, in turn, driven by motors 116 through electrically operated clutches 117 controlled by the selsyn transmitter 62 responsive to the instantaneous elevation of the hull. Specifically, the selsyn transmitter 62 controllably associates the motors 116 with the winches 114 through means of the clutches 117 so that the velocity imparted by the taking up or paying out of the swing lines 20 and 21 is constant regardless of fluctuations in the instantaneous elevation of the hull. The electrical circuitry between the selsyn transmitter 62 and the clutches 117 has been omitted for the sake of simplicity. Electrically operated brakes 120 are provided for "parking" purposes when the dredge is shut down or in the process of being set up. These brakes may be triggered either manually or through the selsyn 62. In either event, however, they are only triggered for parking purposes and perform no function during swinging of the platform 15 by the motors 116. It is to be understood that this circuitry may take any form well within the province of one skilled in the art.

To conclude, from the foregoing description it is believed apparent that the present invention enables the accomplishment of the objects initially set forth herein. In particular, an improved control system is provided to facilitate the rough water use of the dredge disclosed in my Patent No. 2,933,837. It is to be understood that the invention is not intended to be limited to the specific details of the embodiments illustrated and described, but rather as defined by the following claims.

What is claimed is:

1. In an apparatus for working on the floor of a body of water comprising:
   (a) a buoyant hull;
   (b) a submersible platform having floor working means disposed thereon; and,
   (c) guy lines secured between said platform and hull to suspend said platform from said hull and maintain said hull stably above said platform;

the improvement comprising:
   (1) guy line adjustment means to vary the length of said guy lines;
   (2) elevation monitoring means to continuously sense fluctuations in the instantaneous elevation of said hull relative to an area to be worked on the floor of a body of water on which said hull is floating; and,
   (3) means controllably associating said monitoring means with said adjustment means to vary the length of said guy lines responsive to said fluctuations and maintain said guy lines in a condition maintaining said hull stably above said platform during said fluctuations, said controllably associating means functioning to maintain said working means in operative engagement with said area as said instantaneous elevation fluctuates.

2. In an apparatus according to claim 1, including:
   (a) port and starboard swing lines adapted to be anchored to the port and starboard sides, respec-

tively, of said hull, said lines each having slidable connections with said platform; and,

(b) means carried by said hull for selectively paying out and taking up said swing lines to move said platform to the port and starboard;

the improvement further comprising means controllably associating said monitoring means with said taking up and paying out means to maintain constant velocity of movement imparted to said platform by said swing lines as said instantaneous elevation fluctuates.

3. In an apparatus according to claim 2, including:

(a) a pair of vertically disposed equalizer lines secured between said hull and platform, one of said lines being secured to said platform adjacent the port side thereof and the other of said lines being secured to said platform adjacent the starboard side thereof;

(b) tensioning means for selectively placing one of said equalizer lines under tension when said port swing line is being taken up and for placing the other of said equalizer lines under tension when said starboard swing line is being taken up, said means functioning to tension said lines sufficiently to offset platform equilibrium upsetting force offered by resistance of the hull to port and starboard movement; and,

(c) equalizer adjustment means to vary the length of said equalizer lines to accommodate different depths of said body of water;

the improvement further comprising:

(1) means controllably associating said monitoring means with said equalizer adjustment means to vary the length of said equalizer lines responsive to fluctuations in said instantaneous elevation by increments corresponding to said fluctuations;

(2) misalignment monitoring means to continuously sense any port and starboard misalignment of said hull relative to said platform; and,

(3) means controllably associating said misalignment monitoring means with said tensioning means to vary the tension applied to said equalizer lines responsive to port and starboard misalignment of said hull relative to said platform, said latter associating means functioning to return said platform and hull to port and starboard alignment upon such misalignment.

4. In an apparatus according to claim 3, including:

(a) elevator means connected between said hull and platform operable upon extension and retraction thereof to raise and lower said platform with a solely vertical component of movement to and from dredging depths; and,

(b) elevator actuating means carried by said hull to selectively operate said elevator means to extend and retract said elevator means;

the improvement further comprising means controllably associating said elevation monitoring means with said elevator actuating means to extend and retract said elevator means responsive to fluctuations in said instantaneous elevation by increments corresponding to said fluctuations.

5. In an apparatus according to claim 1, including:

(a) port and starboard swing lines adapted to be anchored to the port and starboard sides, respectively, of said hull, said lines each having slidable connections with said platform;

(b) means carried by said hull for selectively paying out and taking up said swing lines to move said platform to the port and starboard;

(c) a pair of vertically disposed equalizer lines secured between said hull and said platform, one of said lines being secured to said platform adjacent the port side thereof and the other of said lines being secured to said platform adjacent the starboard side thereof;

(d) tensioning means for selectively placing one of said equalizer lines under tension when said port swing line is being taken up and for placing the other of said equalizer lines under tension when said starboard line is being taken up, said means functioning to tension said lines sufficiently to offset platform equilibrium upsetting force offered by resistance of the hull to port and starboard movement; and,

(e) equalizer adjustment means to vary the length of said equalizer lines to accommodate different depths of said body of water;

the improvement further comprising:

(1) means controllably associating said monitoring means with said equalizer adjustment means to vary the length of said equalizer lines responsive to fluctuations in said instantaneous elevation by increments corresponding to said fluctuations;

(2) misalignment monitoring means to continuously sense any port or starboard misalignment of said hull relative to said platform; and,

(3) means controllably associating said misalignment monitoring means with said tensioning means to vary the tension applied to said equalizer lines responsive to port and starboard misalignment of said hull relative to said platform, said latter associating means functioning to return said platform and hull to port and starboard alignment upon such misalignment.

6. In an apparatus according to claim 5, including:

(a) elevator means connected between said hull and platform operable upon extension and retraction thereof to raise and lower said platform with a solely vertical component of movement to and from dredging depth; and,

(b) elevator actuating means carried by said hull to selectively operate said elevator means to extend and retract said elevator means;

the improvement further comprising means controllably associating said elevation monitoring means with said elevator actuating means to extend and retract said elevator means responsive to fluctuations in said instantaneous elevation by increments corresponding to said fluctuations.

7. In an apparatus according to claim 1, including:

(a) elevator means connected between said hull and platform operable upon extension and retraction thereof to raise and lower said platform with a solely vertical component of movement to and from dredging depth; and,

(b) elevator actuating means carried by said hull to selectively operate said elevator means to extend and retract said elevator means;

the improvement further comprising means controllably associating said monitoring means with said elevator actuating means to extend and retract said elevator means responsive to fluctuations in said instantaneous elevation by increments corresponding to said fluctuations.

8. In an apparatus according to claim 7, wherein:

(a) said elevator comprises flexible cables reeved over head blocks carried by said hull and platform, respectively, to define a block and tackle arrangement therebetween; and,

(b) said elevator actuating means comprises means locking one end of said cable in place and winch means secured to the other end of said cable to selectively take in and pay out said cable;

the improvement further comprising counterbalance means operatively associated with said winch means to selectively balance the dead weight of said platform.

9. In an apparatus according to claim 1 including a rigid member secured to said platform in fixed elevational relationship with respect thereto, said member extending upwardly from said platform and slidably past said hull; and wherein said monitoring means functions by sensing the position of said hull relative to said member.

10. In an apparatus according to claim 1, wherein:

(a) said guy lines include at least one pair of opposed

flexible cables extending forwardly and outwardly from said platform to said hull, one of said cables extending to the port of said hull and the other of said cables extending to the starboard of said hull; and,

(b) said guy line adjustment means comprises:

(1) block and tackle means operatively interposed in each of said cables; and,

(2) a winch carried by said hull, said winch having reel means on which said cables are each reeved so that selective rotation of said reel means in either one of two directions functions

to simultaneously either take in or pay out both of said cables.

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