US 20050271469A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0271469 A1**

**Zebryk, JR. et al.** (43) **Pub. Date: Dec. 8, 2005**

(54) **BOAT HOIST REMOTE CONTROL SYSTEM**

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(21) Appl. No.: **11/143,217**

(22) Filed: **Jun. 2, 2005**

**Related U.S. Application Data**

(60) Provisional application No. 60/576,131, filed on Jun. 3, 2004.

**Publication Classification**

(51) **Int. Cl.**[7] ..... **B63C 3/06**; B63C 7/00

(52) **U.S. Cl.** ..... **405/3**

(57) **ABSTRACT**

A remote control boat hoist system is presented which has means for automatically positioning a boat hull into water at an optimum depth. An electronically programmable controller, boat hoist remote control device, is comprised of two units; a transmitter and a receiver controls the action of a boat hoist. The transmitter, which can either be hand-held or permanently mounted, contains the electronic circuitry which transmits the various control signals to the receiver either by radio or infrared waves. The transmitter is equipped with a keypad allowing the user to select from various control functions. The receiver, which is mounted near or on the boat hoist, receives the signals sent by the transmitter and decodes them. Depending upon the control signal sent, the receiver operates the mechanical actuators of the boat hoist. These in turn cause the boat hoist to progress upward, downward, tilt, stop, etc. The controller has means for detecting transmission errors between its transmitter unit and receiver unit. Sunlight visible Light Emitting Diodes (LED) are used to indicate operational status of the system. The controller device can also remotely actuate accessory devices.

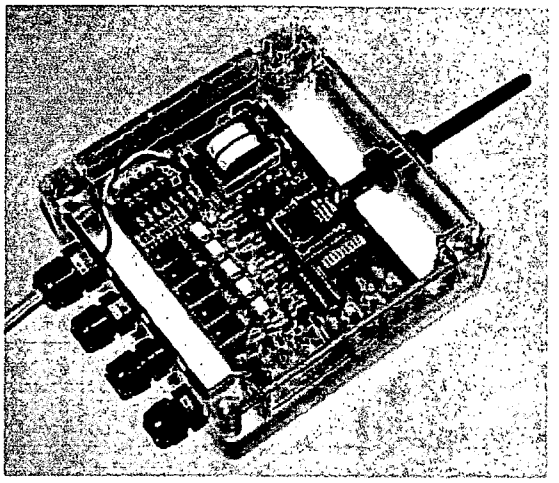


Figure 1

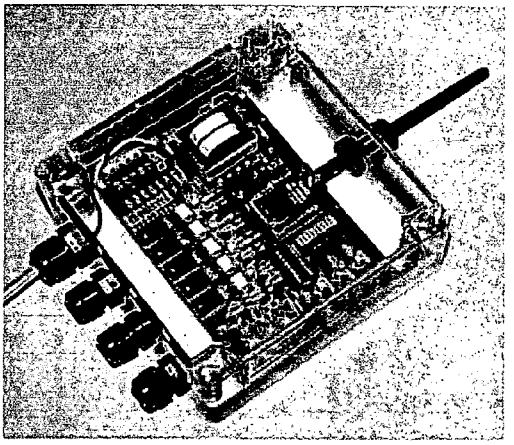


Figure 2

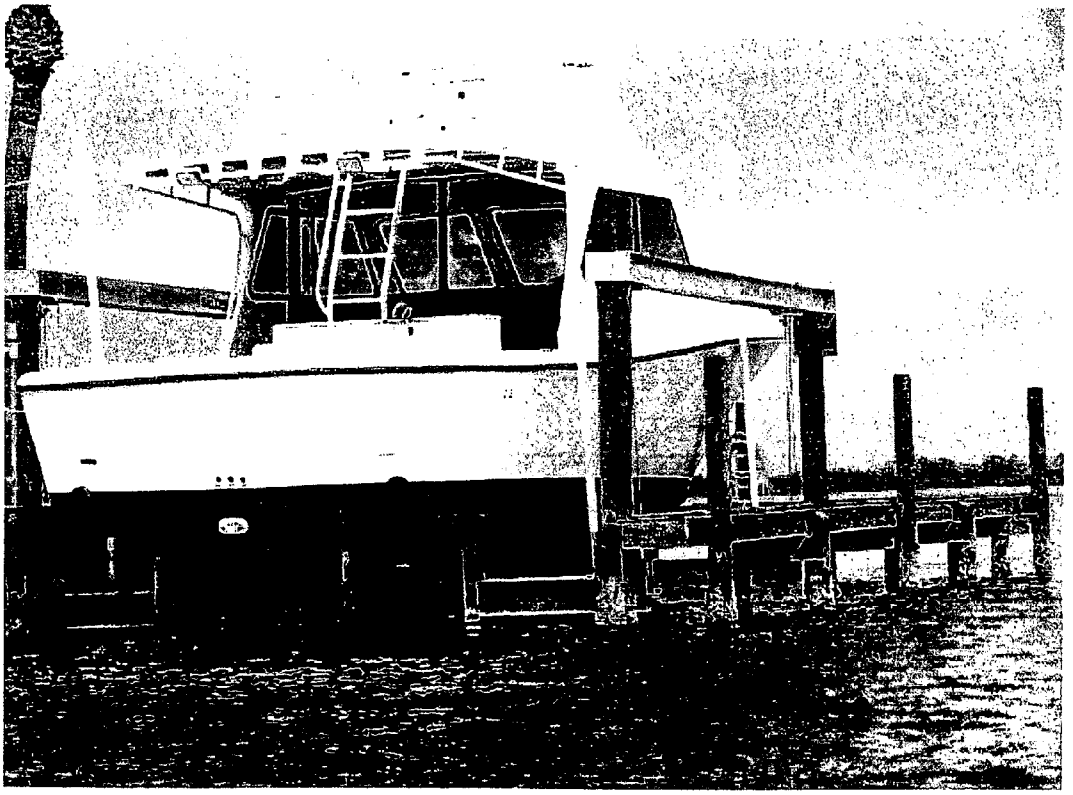


Figure 3
Transmitter

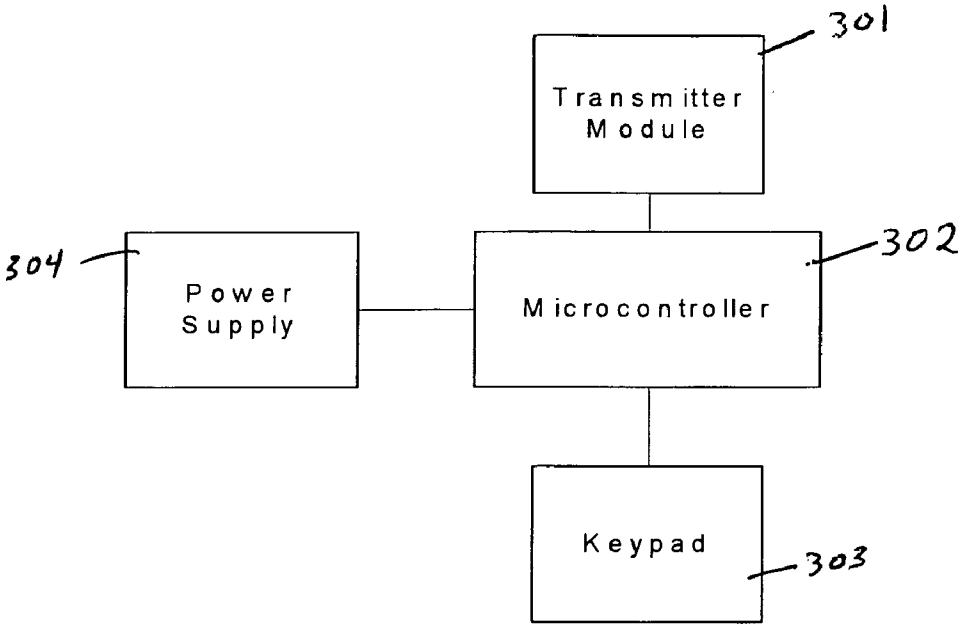



Figure 4
Receiver

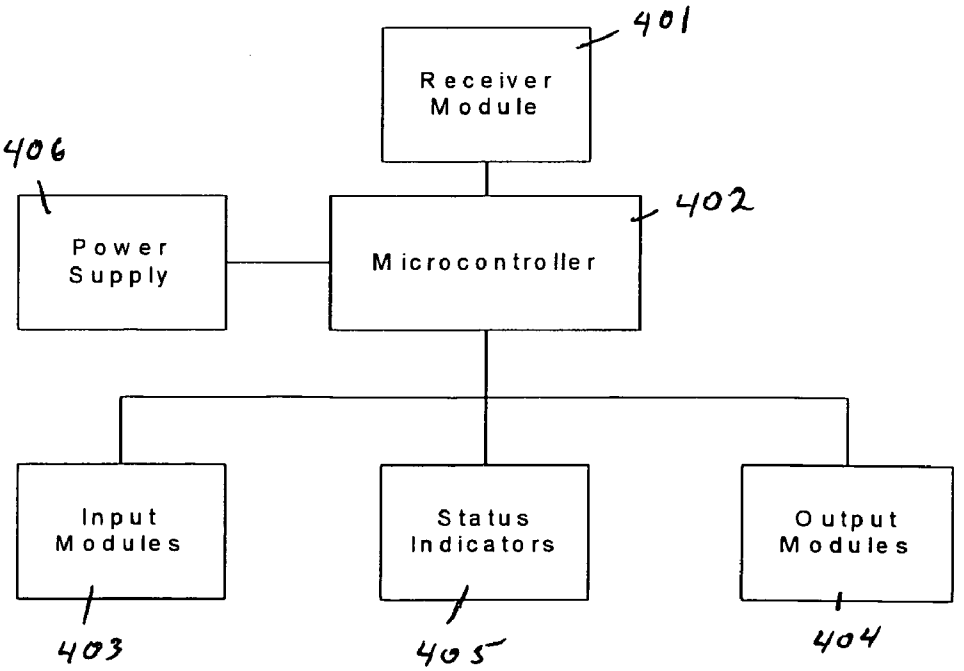


Figure 5
Signaling Protocol

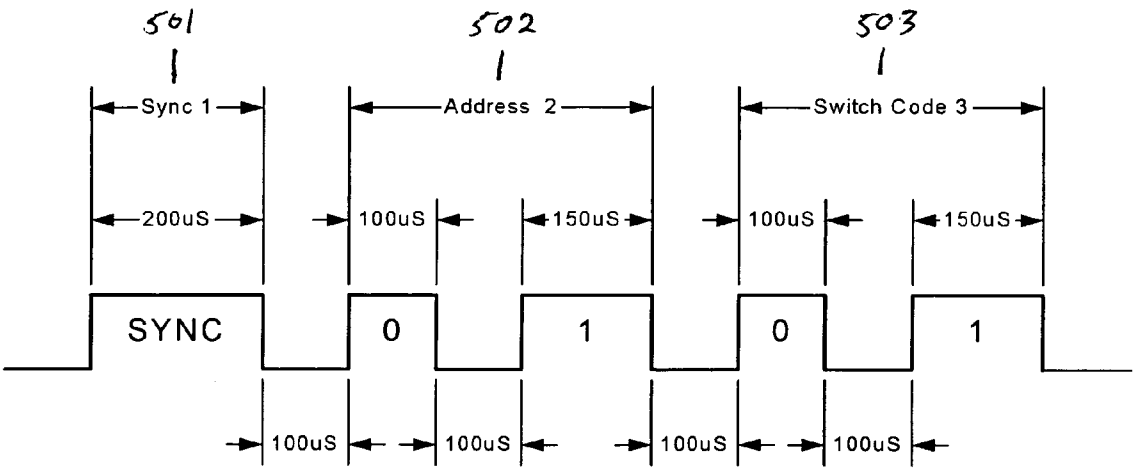


Figure 6
Schematic

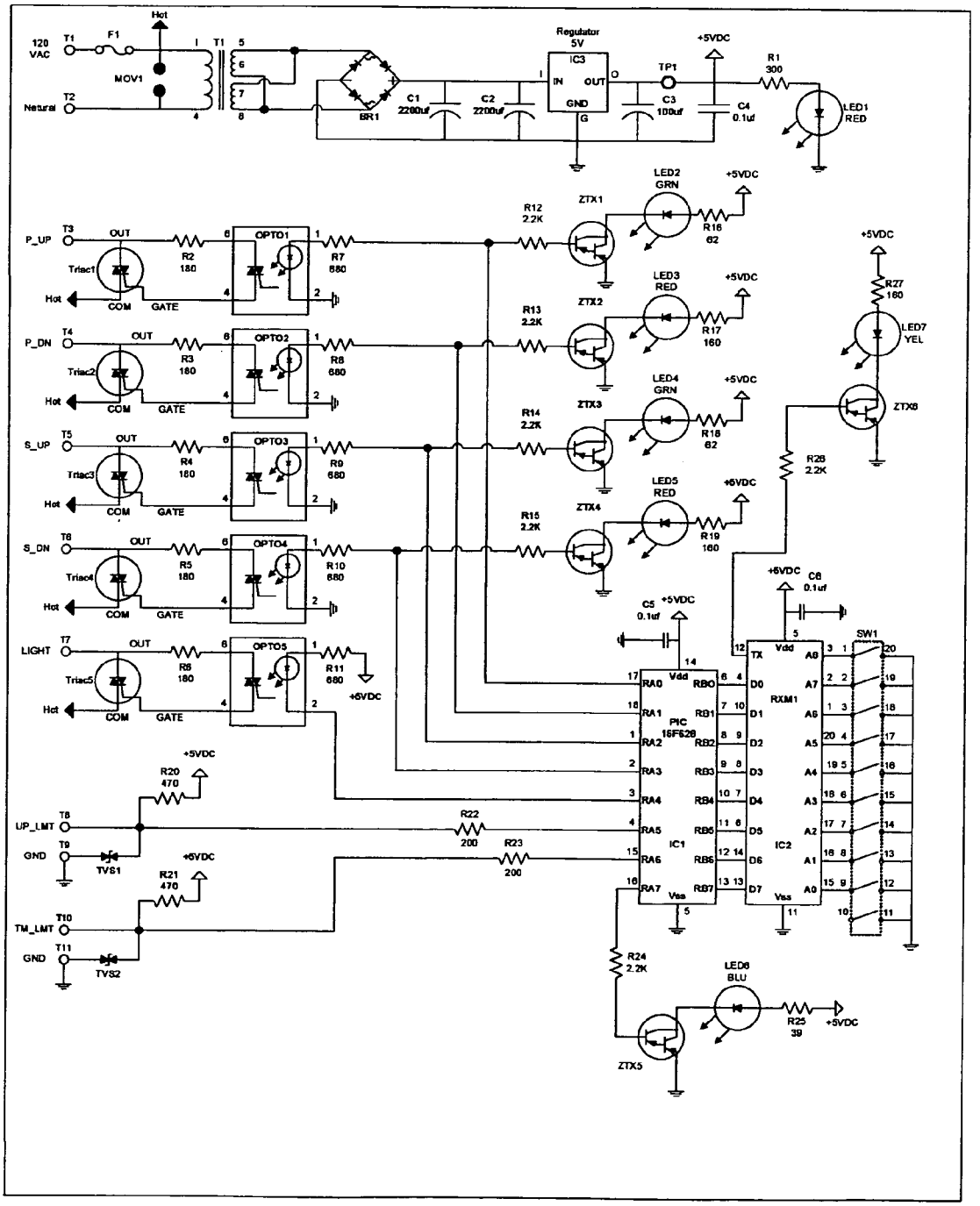
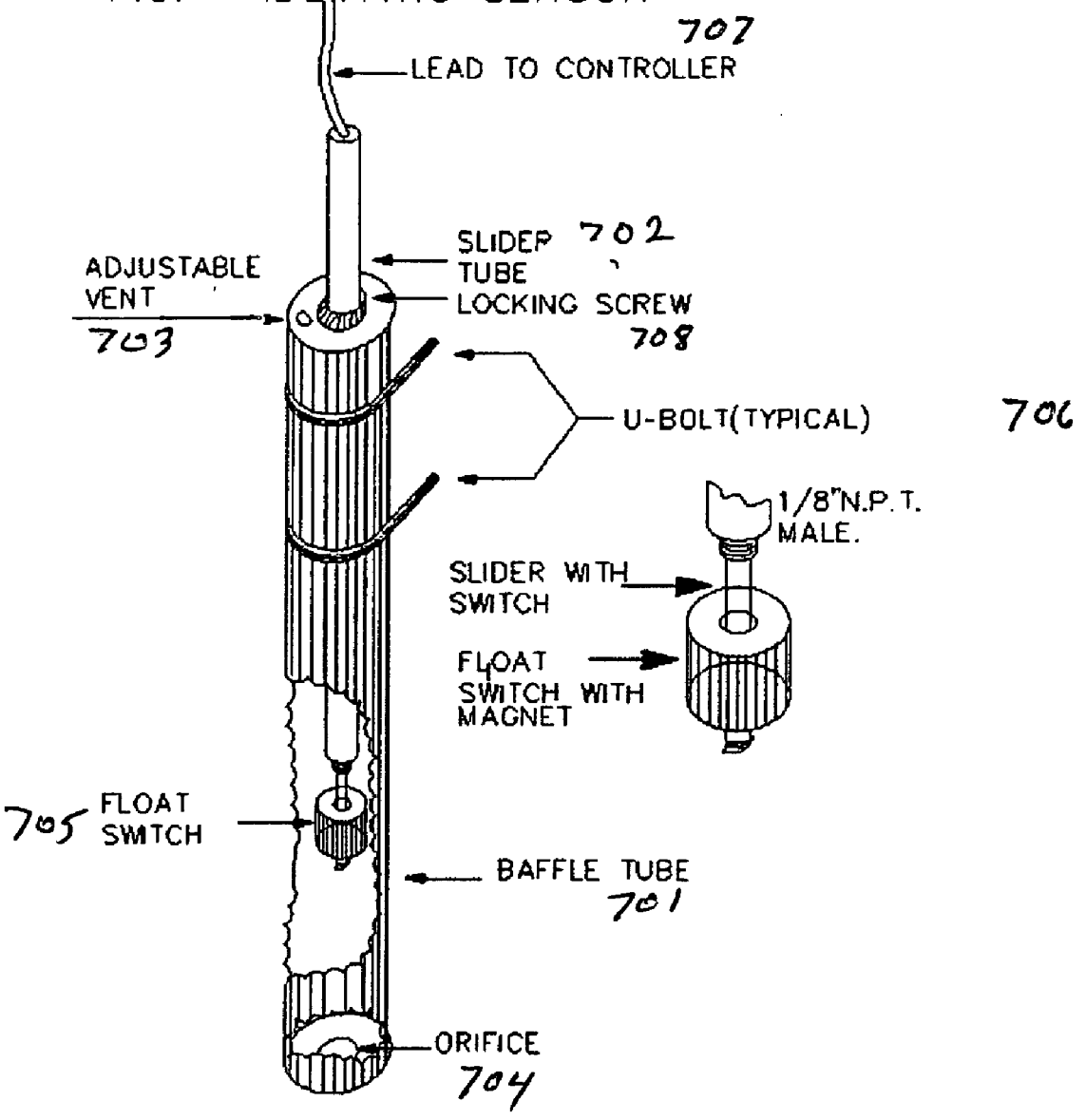


FIG. 7 TIDEMATIC SENSOR



# BOAT HOIST REMOTE CONTROL SYSTEM

## PRIOR FILINGS

[0001] This application claims the benefit of provisional application U.S. Ser. No. 60/576,131, filed Jun. 3, 2004 by inventors John R. Zebryk, Jr. and William C. Mannion, and entitled "Boat Hoist Remote Control".

## BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] This invention relates generally to the field of apparatus for a Boat Hoist Remote Control system. Moreover it pertains specifically to a system for remotely controlling boat hoists and accurately and safely positioning boat hulls into or out of the water.

[0004] 2. Description of Related Art

[0005] Many devices have been proposed for Boat Hoist Remote Control. Some of these devices are found in U.S. Pat. No. 5,593,247, issued to James A. Endres et al. on Jan. 14, 1997.

[0006] However, these devices are limited in their functionality, and typically provide simple up and down control as found in garage door openers. There is a need to significantly expand upon the usefulness of a remote control by providing both momentary and latched modes of operation, the ability to individually control multiple motors and a practical means to position the boat according to the tide or water level.

[0007] Although Endres discloses "vertically spaced height adjustable moisture sensors may be provided along one of the pilings" apparently to determine water level, and use same to accommodate for changing tides, Endres fails to articulate a workable implementation. In a marine environment, moisture is omnipresent, caused by wave action, wind, high humidity, rain, boat wakes, and fog. Sensors sensitive to moisture would be complex, unreliable, inaccurate, expensive and impractical.

[0008] It is therefore an object of the Boat Hoist Remote Control System invention to provide a means for automatic boat hoist cradle positioning with safety and cost efficiency.

## OBJECTIVES AND SUMMARY OF THE INVENTION

[0009] A principal objective of the present invention is to provide a Boat Hoist Remote Control that will overcome the deficiencies of the prior art devices.

[0010] An objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means for automatically positioning the hull into the water at the optimum depth.

[0011] Another objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means for automatically positioning the hull into the water at the optimum depth employing a hydraulic technique to minimize the effects of wave action.

[0012] Yet another objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means for automatically positioning the hull into the water at the optimum depth employing a software technique to minimize the effects of wave action.

[0013] Still another objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means for automatically limiting the excursion of travel.

[0014] A further objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means for minimizing motor starts whilst maintaining safety utilizing time-out timer which automatically stops all motion unless periodically over-ridden via actuation of a keypad function.

[0015] A still further objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means for actuating accessory devices.

[0016] Another objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means for leveling and draining the boat.

[0017] A yet further objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means for detecting transmission errors between the transmitter and the receiver.

[0018] Another objective of the present invention is to provide a Boat Hoist Remote Control device and system that provides means indicating operational status via the employment of sunlight visible Light Emitting Diodes.

[0019] Briefly stated, the present invention is a remote control boat hoist system which has means for automatically positioning a boat hull into water at an optimum depth. An electronically programmable controller, boat hoist remote control device, is comprised of two units; a transmitter and a receiver controls the action of a boat hoist. The transmitter, which can either be hand-held or permanently mounted, contains the electronic circuitry which transmits the various control signals to the receiver either by radio or infrared waves. The transmitter is equipped with a keypad allowing the user to select from various control functions. The receiver, which is mounted near or on the boat hoist, receives the signals sent by the transmitter and decodes them. Depending upon the control signal sent, the receiver operates the mechanical actuators of the boat hoist. These in turn cause the boat hoist to progress upward, downward, tilt, stop, etc. The controller has means for detecting transmission errors between its transmitter unit and receiver unit. Sunlight visible Light Emitting Diodes (LED) are used to indicate operational status of the system. The controller device can also remotely actuate accessory devices.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The following drawings further describe by illustration the advantages and objects of the present invention. Each drawing is referenced by corresponding figure reference characters within the "DETAILED DESCRIPTION OF THE INVENTION" section to follow.

[0021] **FIG. 1**. is a perspective view of a Boat Hoist Remote Control device according to the present invention.

[0022] **FIG. 2**. is a perspective view of a Boat Hoist Remote Control system according to the present invention.

[0023] **FIG. 3**. is a block diagram of a Boat Hoist Remote Control transmitter unit according to the present invention.

[0024] **FIG. 4**. is a block diagram of a Boat Hoist Remote Control receiver unit according to the present invention.

[0025] **FIG. 5**. is a diagram of a Boat Hoist Remote Control system signaling protocol according to the present invention.

[0026] **FIG. 6**. is a schematic diagram of a Boat Hoist Remote Control receiver controller unit according to the present invention.

[0027] **FIG. 7**. is a perspective view of a Boat Hoist Remote Control TideMatic apparatus according to the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

[0028] In view of the limitations now present in the prior art, the present invention provides a new and useful Boat Hoist Remote Control device and system which is simpler in construction, more universally usable and more versatile in operation than known apparatus of this kind.

[0029] The purpose of the present invention is to provide a new Boat Hoist Remote Control device that has many novel features not offered by the prior art apparatus that result in a new Boat Hoist Remote Control device and system which is not apparent, obvious, or suggested, either directly or indirectly by any of the prior art apparatus

[0030] In contrast to the prior art, the Boat Hoist Remote Control system uses a hydraulic technique which is simple, reliable, accurate, inexpensive and practical. By mounting the sensor to the hoist cradle, instead of a fixed object, many benefits are achieved. The float sensor is sensitive to water pressure acting upon the float and indicates not the depth of the water, but the relative position of the hull in the water instead. Further, instead of being constantly immersed or exposed to water, the sensor is only exposed during launching or loading operations of the boat hoist. Further still, by incorporating both a software and hydraulic technique for compensating for wave action, it is accurate and provides for optimum positioning of the boat for loading or launching.

[0031] The benefits provided by the Boat Hoist Remote Control system for automatically positioning the boat into the water are numerous. As in all known existing boat hoists employ the use of manual means by eye, it is difficult to do so accurately and conveniently. If the boat cradle is lowered too far, the boat can be pushed about by waves causing severe damage to the boat, the cradle or the dock. If the boat is lowered not far enough, the amount of power necessary to launch or load can also cause severe damage. Further still, safety is comprised when the excessive power required causes a sudden uncontrolled jerk when the boat breaks free from the cradle. The optimum position is wherein a minimum amount of power is required to launch or load, yet wherein the boat is firmly constrained by the cradle.

[0032] The Boat Hoist Remote Control device and system were designed to improve upon the safety and convenience of controlling boat hoists used to lower and raise marine craft into or out of the water. In contrast with permanently wired electrical controls, it allows the operator to safely control the motion from a distance and provides for automated functions not currently available. It is primarily comprised of two units; a transmitter and a receiver.

[0033] The transmitter unit is typically hand-held and is equipped with a keypad which allows the operator to control the motion(s) of the boat hoist. In the current embodiment, these include the basic functions of up and down, as well as port up/down and starboard up/down for hoists having two or more lift motors. These latter function(s) allow for leveling operations and also facilitate the draining of the boat by canting it sideways.

[0034] The receiver unit is typically permanently mounted to the boat hoist mechanism and controls the operation of the lifting motor(s). Usually encased in a waterproof housing, it decodes the signals sent to it by the transmitter, and depending upon the status of one or more external inputs, determines the direction of rotation of the motor(s). Typically, for large AC motors, control is accomplished through relays or contactors. Contained in a separate waterproof housing, these are usually permanently wired to the motors directly.

[0035] In the current embodiment, the transmitter allows the operator to select from eight different control functions using the keypad. These are as follows:

| | |
|---|---|
| Up: | Hoist motion upwards. |
| Down: | Hoist motion downwards. |
| Jog Port Up: | Port motor upwards. |
| Jog Port Down: | Port motor downwards. |
| Jog Starboard Up: | Starboard motor upwards. |
| Jog Starboard Down: | Starboard motor upwards. |
| TideMatic: | Tide seeking mode. |
| Light: | Turns On/Off work light. |

[0036] The "Up/Down" functions are both latching types. Depressing once turns ON, depressing again turns off.

[0037] Jog functions are momentary types, depressing turns ON, release turns OFF. These provide for the leveling of the boat to accommodate for winch cable slippage. These also provide for a controlled means to purposely cant the boat for draining.

[0038] The "TideMatic" function when enabled, lowers the boat into the water and automatically stops motion when the hull is positioned at the optimum water depth for launching or loading. This eliminates the need to manually position the hoist and is of significant convenience to the operator.

[0039] The "Light" feature turns On/Off a work light on the boat hoist and/or dock and is of significant convenience and safety when docking/loading at night.

[0040] For safety purposes, depressing any of the Jog or Up/Down functions, immediately stops all motion of the hoist. The allows the operator to depress any one of six functions instead of a single "STOP" function to successfully cease motion.

[0041] For safety purposes, the Up/Down functions have been designed to operate for a maximum of 60 seconds, then automatically stop. This can be reset whilst operating by momentarily depressing the Light function. This provides for an important "dead-man" safety feature whilst eliminating excessive "motor starts".

[0042] Referring now descriptively to the drawings, the attached figures illustrate a Boat Hoist Remote Control device.

[0043] **FIG. 1**, illustrates an actual Boat Hoist Remote Control device with its transmitter and receiver units according to the present invention. Further in **FIG. 2**, is pictured a typical boat hoist system for use with the Boat Hoist Remote Control device.

[0044] As seen in **FIG. 3**, the Boat Hoist Remote Control transmitter is comprised of a radio frequency or infrared transmitter module **301**, a microcontroller **302**, a keypad **303**, and a power supply **304**. Normally "OFF" or "ASLEEP" to conserve battery life, the microcontroller turns "ON" or "WAKES-UP" when a button is pressed. According to the numeric value of the button pressed, the microcontroller sends a series of binary digits to the transmitter module as seen in **FIG. 5**. The transmitter module modulates the RF or IR carrier which is broadcast to the receiver. In the current embodiment, CW (carrier wave) modulation is used. Alternatively, other modulation techniques such as AM. FM, FSK, or PSK could be employed as well.

[0045] As seen in **FIG. 5**, the command transmitted, is in the form of a packet. This is comprised of a synchronization pulse **501**, an address field **502**, and a switch code field **503**. To enable the receiver to determine whether inference has corrupted a packet, the address and switch codes are sent two to three times. The packet shown in **FIG. 5** is of a 2-bit address (binary 01) and 2 bit switch code (binary 01). The current embodiment is based upon a 10-bit address (1024 combinations) and an 8-bit switch code (256 combinations).

[0046] The receiver, as seen in **FIG. 4**, is comprised of a receiver module **401**, a microcontroller **402**, input modules **403**, output modules **404**, status indicators **405**, and a power supply **406**. The receiver module demodulates the carrier sent by the transmitter and sends a series of binary pulses to the microcontroller. Constantly scanning for a synchronization pulse, the microcontroller uses this to identify the beginning of a valid packet. Detecting same, it decodes the following address and switch code fields which are repeated two to three times. If each of these fields is identical, the packet is deemed error free. The microcontroller then compares the received address with the one programmed into it, and, if identical, processes the command.

[0047] Depending upon the command received, and upon the current status of the system, the microcontroller **402**, will implement various functions as seen in **FIG. 6** according to a software program contained within. These include the following:

[0048] If the LIGHT code is received, the work light is toggled from ON to OFF or OFF to ON.

[0049] If a JOG code is received, the associated jog output is switched ON.

[0050] If in any JOG mode, receipt of the null or ZERO code, switches all jog outputs to OFF.

[0051] If an UP or a DOWN code is received, the up motor output(s) is switched ON.

[0052] Whilst the hoist is in up, down or Tidematic modes, if a UP, DOWN, JOG or TideMatic code is received, all motor output(s) are turned off. This provides for multiple opportunities to terminate motion from multiple buttons.

[0053] If a TideMatic code is received, and the down motor output(s) is switched ON.

[0054] If the hoist in UP or DOWN mode, a sixty second timer is set. If this expires the UP or DOWN output(s) is switched OFF.

[0055] If a Light code is received whilst in the UP or DOWN mode, the sixty second timer is reset to zero thereby providing a "dead-man" safety feature and eliminating a motor start.

[0056] If in JOG, UP, DOWN, or in TideMatic mode, and the associated limit switch or sensor becomes activated, the associated output is switched OFF.

[0057] If in TideMatic mode, in the current embodiment, the associated limit switch or sensor is required to be activated for 3-15 seconds providing protection from the variability of wave action.

[0058] As seen in **FIG. 4**, the receiver has a number of output modules **404**. Controlled by outputs from the microcontroller, these, in the current embodiment, are triac driver integrated circuits which in turn control zero-crossing "snubberless" triac's. In the current embodiment, these are wired to an external AC contactor which is wired to the AC motor(s). Alternatively, employing multiple triacs in parallel, or by using SCR's, the AC motors could be controlled directly. Alternatively, for control of DC motor(s), relays or MOSFET's could be employed.

[0059] As further seen in **FIG. 4**, input modules **403**, are digital inputs to microcontroller **404**, in the current embodiment, and are equipped with "Transient Voltage Suppressor" devices to protect from transient voltage spikes. Alternatively, analog sensors could be employed by utilizing the analog to digital converter ports of the microcontroller.

[0060] Status indicators **405**, annunciate the following, in the current embodiment, using "sunlight visible" LED's which can be seen in direct sunlight at 150 yards.

| | | |
|---|---|---|
| Power | Red | (conventional) |
| Error-Free Packet Received | Yellow | 14,000 mcd |
| Port Motor Up | Green | 7,000 mcd |
| Port Motor Down | Red | 20,000 mcd |
| Starboard Motor Up | Green | 7,000 mcd |
| Starboard Motor Down | Red | 20,000 mcd |
| TideMatic Mode On | Blue | 2,500 mcd |

[0061] Power supply **406**, in the current embodiment, is of a linear design, capable of operation between 85-150 VAC and is protected from line transients by a "Metal Oxide Varistor" (MOV) and a current limiting fuse device. Alternatively, a 6-24 DC power supply could be employed.

[0062] As seen in **FIG. 7**, the TideMatic water level sensing apparatus is comprised of the following; Float Baffle **701**, Float **702**, Float Switch **703**, and Float Baffle Orifice **704**. Upon activation of the TideMatic function, the boat cradle is lowered into the water, wherein upon immersion, water begins flowing into Float Baffle **701**. The rate of egress

of water is controlled by the diameter of Float Baffle Orifice **704**, which is appropriately sized to dampen the effects of wave action. When the water level within Float Baffle **701** causes Float **702** to rise and operate Float Switch **703**, this change is sent via Float Lead **706** which is detected by the microcontroller **404**, and the TideMatic mode is terminated. The depth to which the boat is immersed is adjusted by moving Slider **707** up or down within Float Baffle **701**. The TideMatic sensor is mounted to the boat cradle, in the current embodiment, via U-Bolts **708**.

[**0063**] It will also be understood that, in addition to Boat Hoist Remote Control, the device can be used boat hoists and boat davits.

[**0064**] Having described preferred embodiments of the invention with reference to the accompanying drawings, it is to be understood that the invention is not limited to these precise embodiments, and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention as defined in the appended claims, including changes in application or method of use or operation, method of manufacture, shape, size, or material which are not specified within the detailed written description or illustrations contained herein yet would be apparent or obvious to one skilled in the art.

What is claimed is:

**1**. A boat hoist remote control system in contact with a dock comprising:

a boat hull lifting subsystem;

wherein said lifting subsystem is in contact with said dock, and comprises a boat hoist having at least one lifting motor;

an electronic programmable controller comprising a transmitter unit and a receiver unit;

means for automatically positioning a boat hull into water at an optimum depth;

wherein said transmitter unit has a keyboard and said unit is not physically or electrically connected to other components of said remote control system;

wherein said receiver unit is in electrical contact with said lifting subsystem; and

wherein said transmitter unit comprises means to indicate operational status of system and keyboard functions for remotely controlling hoist operation.

**2**. The hoist remote control system according to claim 1, wherein said lift subsystem has at least one lifting motor to control boat port side movement and at least one lifting motor to control boat starboard movement and said transmitter unit has keyboard functions to control jogging each motor individually.

**3**. The hoist remote control system according to claim 1, wherein said means for automatically positioning said boat hull is a float sensor attached to said boat hoist.

**4**. The hoist remote control system according to claim 3, wherein said means for automatically positioning employs a hydraulic technique to minimize effects of wave action.

**5**. The hoist remote control system according to claim 3, wherein said means for automatically positioning employs a software technique to minimize effects of wave action.

**6**. The remote control hoist system according to claim 1, further comprising a means for automatically limiting excursion of travel for safety reasons.

**7**. The remote control hoist system according to claim 1, further comprising a means to automatically stop all motion unless periodically overridden via actuation of a keyboard function for safety reasons and to minimize motor starts.

**8**. The remote control hoist system according to claim 7, wherein said means to automatically stop all motion comprises a timer associated with Up/Down switches in said transmitter unit, which permit hoist operation in the selected direction to be sustained for no more than 60 seconds without further actuation of a keyboard function to reset timer to zero.

**9**. The remote control hoist system according to claim 1, further comprising a means for remotely actuating accessory devices

**10**. The hoist remote control system according to claim 2, further comprising means for leveling and draining said boat hull.

**11**. The hoist remote control system according to claim 1, further comprising means for detecting transmission errors between said transmitter unit and said receiver unit.

**12**. The hoist remote control system according to claim 1, wherein said means to indicate operational status employs sunlight visible Light Emitting Diodes.

**13**. The hoist remote control system according to claim 1, wherein said keyboard functions regulate at least following actions—Up, Down, Jog Up, Jog Down, TideMatic, Light;

wherein Up/Down initiates or stops hoist upward/downward motion;

wherein Jog Up/Jog Down while pressed down allows upward/downward motion of hoist, and when released turns motion off;

wherein TideMatic places system in tide seeking mode; and wherein Light switches On/Off work light on said boat hoist.

**14**. The hoist remote control system according to claim 1, wherein said keyboard functions regulate Jog Port Up, Jog Port Down, Jog Starboard Up, Jog Starboard Down in place of said Jog Up/Down function pair of claim 13.

**15**. The remote control hoist system according to claim 1, wherein said receiver unit is usually encased in a waterproof housing as is each lifting motor.

**16**. The hoist remote control system according to claim 13, wherein said TideMatic function key initiates automatic positioning of said boat hull into water at an optimum depth.

**17**. A boat hoist remote controller and boat positioning sensor comprising:

an electronic programmable controller comprising a transmitter unit and a receiver unit;

means for automatically positioning a boat hull into water at an optimum depth;

wherein said transmitter unit has a keyboard and said unit is not physically or electrically connected to other components of said remote control system;

wherein said receiver unit is in electrical contact with a lifting subsystem of a boat hoist; and

wherein said transmitter unit comprises means to indicate operational status of system and keyboard functions for remotely controlling boat hoist operation.

**18**. The boat hoist remote controller according to claim 17, wherein said means for automatically positioning said boat hull is a float sensor attached to a boat hoist.

* * * * *