METHODS AND SYSTEMS FOR RAISING AND LOWERING A RIG MAST AND SUBSTRUCTURE BY REMOTE CONTROL

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ABSTRACT
Systems for drilling operations, the systems including: a drilling rig with a base; a mast movably connected to the base of the drilling rig; a drawworks system for raising and lowering the mast; a drawworks control system for controlling the drawworks as it raises and lowers the mast; a remote control system for remotely controlling the drawworks control system so that the mast can be raised and lowered by personnel spaced apart from the drilling rig; and, in certain aspects, the rig including a substructure which can be raised, and lowered by remote control. This abstract is provided to comply with the rules requiring an abstract which will allow a searcher or other reader to quickly ascertain the subject matter of the technical disclosure and is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims, 37 C.F.R. 1.72(b).
METHODS AND SYSTEMS FOR RAISING AND LOWERING A RIG MAST AND SUBSTRUCTURE BY REMOTE CONTROL

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention
[0002] This invention is directed to drilling rigs with erectable masts and substructures; and to systems and methods for raising and lowering, by remote control, such parts that are raised, e.g. rig components.

[0003] 2. Description of Related Art

[0004] The prior art discloses a variety of rigs used in drilling and various well bore operations; for example, and not by way of limitation, U.S. Pat. Nos. 3,340,938; 3,807,109; 3,922,825; 3,942,593; 4,260,395; 4,290,495; 4,368,602; 4,489,526; 4,569,168; 4,837,992; 6,634,436; 6,523,319 and the references cited in these patents—all these patents incorporated fully herein for all purposes.

[0005] In many land drilling operations, land rigs are delivered to a site, assembled and then disassembled. One of the first steps in assembling many rigs is to raise a rig mast from a substantially horizontal transportation position to a substantially vertical operational position. In many prior methods, the mast is raised and lowered by personnel on structure immediately adjacent the mast with controls and related devices that are hard-wired to mast raising apparatuses such as a drawworks.

[0006] U.S. Pat. No. 3,922,825 discloses a rig with a stationary substructure base and a movable substructure base mounted thereon which is coupled to the stationary base and swings upright on an elevated position on a series of struts that are connected to the stationary base with swivel connections at each end. The movable base is otherwise stationary since neither the stationary base nor the movable base are mobile or repositionable without the use of an auxiliary crane or the like. The movable substructure base and the drill mast are raised with a winch mounted on an auxiliary winch truck.

[0007] U.S. Pat. No. 3,942,593 discloses a mobile well drilling rig apparatus which has a trailerable telescoping mast and a separate sectional substructure assembly with a rig base, a working floor, and a rail structure. The mast is conveyed to the top of the substructure by rollers and is raised by hydraulic raising apparatus to an upright position. With such a system the mast assembly can be relatively long when transporting it and the mast can be unstable during raising.

This system uses drawlines and winch apparatus to raise the mast onto the working floor.

[0008] U.S. Pat. No. 6,634,436 discloses a mobile land drilling apparatus and method. The rig has a mobile telescoping substructure box. A lifting apparatus selectively supports the mobile telescoping substructure box unit in a raised position and lowered position. An extension cylinder further extends the mobile telescoping substructure box unit in telescopic extension. A stationary frame member and a telescoping frame member have a plurality of cables attached thereto for supporting the telescoping frame member when extended. A trolley winch allows completion of the rig assembly without an external crane.

BRIEF SUMMARY OF THE INVENTION

[0009] The present invention, in certain aspects, provides a system for remotely raising and lowering a mast of a drilling rig. In one particular aspect, an operator at a distance from a rig, using a remote control system according to the present invention, controls a rig’s control system, thereby remotely controlling a rig drawworks and associated cables that are used to raise and lower the mast of the rig. In one aspect, the rig has a substructure and the structure is raised and lowered by remote control.

[0010] In certain aspects, the present invention discloses a system that includes a land rig with an erectable mast; a drawworks; a substructure; a rig control system for controlling the drawworks; and a remote control system in communication with the rig control system for controlling the drawworks to raise and lower the mast and for raising and lowering the substructure.

[0011] Accordingly, the present invention includes features and advantages which are believed to enable it to advance rig component raising and lowering technology. Characteristics and advantages of the present invention described above and additional features and benefits will be readily apparent to those skilled in the art upon consideration of the following detailed description of preferred embodiments and referring to the accompanying drawings.

[0012] Certain embodiments of this invention are not limited to any particular individual feature disclosed here, but include combinations of them distinguished from the prior art in their structures, functions, and/or results achieved. Features of the invention have been broadly described so that the detailed descriptions that follow may be better understood, and in order that the contributions of this invention to the arts may be better appreciated. There are, of course, additional aspects of the invention described below and which may be included in the subject matter of the claims to this invention. Those skilled in the art who have the benefit of this invention, its teachings, and suggestions will appreciate that the concepts of this disclosure may be used as a creative basis for designing other structures, methods and systems for carrying out and practicing the present invention. The claims of this invention are to be read to include any legally equivalent devices or methods which do not depart from the spirit and scope of the present invention.

[0013] What follows are some of, but not all, the objects of this invention. In addition to the specific objects stated below for at least certain preferred embodiments of the invention, there are other objects and purposes which will be readily apparent to one of skill in this art who has the benefit of this invention’s teachings and disclosures. It is, therefore, an object of at least certain preferred embodiments of the present invention to provide the embodiments and aspects listed above and:

[0014] New, useful, unique, efficient, non-obvious drilling rigs, systems for raising and lowering components of a rig (e.g. a mast and/or a substructure), and remote control systems for doing this; and

[0015] Such systems in which drawworks brakes are remotely controlled; and

[0016] Such systems in which joystick apparatus on a remote control system according to the present invention is used to remotely control the speed of raising or lowering a mast.

[0017] The present invention recognizes and addresses the problems and needs in this area and provides a solution to those problems and a satisfactory meeting of those needs in its various possible embodiments and equivalents thereof. To one of skill in this art who has the benefits of this invention’s realizations, teachings, disclosures, and suggestions, various
purposes and advantages will be appreciated from the following description of preferred embodiments, given for the purpose of disclosure, when taken in conjunction with the accompanying drawings. The detail in these descriptions is not intended to thwart this patent's object to claim this invention no matter how others may later attempt to disguise it by variations in form or additions of further improvements.

[0018] The Abstract that is part hereof is to enable the U.S. Patent and Trademark Office and the public generally, and, scientists, engineers, researchers, and practitioners in the art who are not familiar with patent terms or legal terms of phraseology to determine quickly from a cursory inspection or review the nature and general area of the disclosure of this invention. The Abstract is neither intended to define the invention, which is done by the claims, nor is it intended to be limiting of the scope of the invention or of the claims in any way.

[0019] It will be understood that the various embodiments of the present invention may include one, some, or all of the disclosed, described, and/or enumerated improvements and/or technical advantages and/or elements in claims to this invention.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0020] A more particular description of embodiments of the invention briefly summarized above may be had by references to the embodiments which are shown in the drawings which form a part of this specification. These drawings illustrate certain preferred embodiments and are not to be used to improperly limit the scope of the invention which may have other equally effective or equivalent embodiments.

[0021] FIG. 1 is a side schematic view of a system according to the present invention.

[0022] FIG. 2 is an enlargement of part of the system shown in FIG. 1.

[0023] FIG. 3 is a side view showing a step in the raising of a mast of the system of FIG. 1.

[0024] FIG. 4 is a side view showing a step in the raising of a mast of the system of FIG. 1.

[0025] FIG. 5 is a side view showing a step in the raising of a mast of the system of FIG. 1.

[0026] FIG. 6 is a side view showing a step in the raising of components of the system of FIG. 1.

[0027] FIG. 7 is a side view showing a step in the raising of components of the system of FIG. 1.

[0028] FIG. 8 is a side view showing a step in the raising of components of the system of FIG. 1.

[0029] FIG. 9 is a top view of a console for a remote control system according to the present invention.

[0030] FIG. 10 is a schematic view of a system according to the present invention.

[0031] Presently preferred embodiments of the invention are shown in the above-identified figures and described in detail below. Various aspects and features of embodiments of the invention are described below and some are set out in the dependent claims. Any combination of aspects and/or features described below or shown in the dependent claims can be used except where such aspects and/or features are mutually exclusive. It should be understood that the appended drawings and description herein are of preferred embodiments and are not intended to limit the invention or the appended claims. On the contrary, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the invention as defined by the appended claims. In showing and describing the preferred embodiments, like or identical reference numerals are used to identify common or similar elements. The figures are not necessarily to scale and certain features and certain views of the figures may be shown exaggerated in scale or in schematic in the interest of clarity and conciseness.

[0032] As used herein and throughout all the various portions (and headings) of this patent, the terms “invention”, “present invention” and variations thereof mean one or more embodiment, and are not intended to mean the claimed invention of any particular appended claim(s) or all of the appended claims. Accordingly, the subject or topic of each such reference is not automatically or necessarily part of, or required by, any particular claim merely because of such reference. So long as they are not mutually exclusive or contradictory any aspect or feature or combination of aspects or features of any embodiment disclosed herein may be used in any other embodiment disclosed herein.

DETAILED DESCRIPTION OF THE INVENTION

[0033] The present invention provides systems and methods for remotely controlling rig apparatus used to raise and lower a rig mast. This invention’s teachings are applicable to any rig which has an errectable mast raised and lowered by a drawworks and substructure raised with hydraulic winches or cylinders.

[0034] FIG. 1 shows a system 10 according to the present invention which includes a drilling rig 12 with a derrick 14, an A-frame 16, as part of the rig 12, on a floor 16 mounted to a substructure 18. A mast 20 pivotally connected to the floor 16 is, as shown, initially in a substantially horizontal position, e.g., for transport. The mast 20 is a typical drilling rig mast with top sheaves 22 or crown, a set of raising sheaves 24, and a raising connection lug 26. A drill line 33 is winched in an out by a drawworks 30. Lines 31 and 32 which run around the sheaves 27 and raising sheaves 24, used to raise the mast, are attached together and lifted by the traveling block 90 when the traveling block 90 is pulled with the line 33 winched by the drawworks 30. Operations personnel use a cabin 28 on the floor 16. A rig control system 34 controls the drawworks 30.

[0035] The drill line 33 extends over a “brakeover” sheave 35 down to the drawworks 30. The cables 31 and 32 extend over the raising sheaves 24 (e.g. eight in total) fixed in different areas on the mast and A-frame and are attached to a slingline equalizer 91 by the traveling block 90.

[0036] An operator A with a remote control system 40 according to the present invention is spaced-apart from the drilling rig 12. The remote control system 40 remotely controls the rig control system 34. As shown in FIG. 3, the operator A has activated the remote control system 40 to take control of the drawworks 30 via the rig control system 34; and has initiated raising of the mast 20. The mast 20 has pivoted upwardly from its initial horizontal position. FIG. 4 shows the mast 20 pivoted further upwardly. The mast raising mechanism has been activated by the drawworks 30 spooling the drill line 33, while the traveling block 90 and the slingline equalizer 91 travel in the mast from bottom to top, and in turn the slingline equalizer 91 pulls with it the raising lines 31 and 32, lifting the mast.

[0037] As shown in FIG. 5, the mast 20 is fully erect. As shown in FIG. 6, raising of the substructure 18 has commenced (also done by remote control) to raise the floor 16 and derrick to a desired height above ground G, with the remote
control system 40 remotely controlling raising/lowering apparatuses 18a, by controlling the flow of hydraulic fluid to the winches pulling them up. A cable tray or “grasshopper” support 81a is used with the system. FIG. 7 illustrates further raising of the floor 16. FIG. 8 shows the floor 16 raised to a desired height.

[0038] FIG. 9 shows one embodiment of a remote control system 50 according to the present invention useful as the remote control system 40 of FIG. 1. FIG. 10 is a schematic view showing connections between a drawworks DK (like the drawworks 30, FIG. 1), with a motor or motors M and a brake system BS, a drawworks control system CS (like the system 34, FIG. 1) and the remote control system 50. The drawworks has an emergency park brake, an eddy current brake, or “Baylor” brake, and typical service brakes. The brakes require cooling and the cooling system CT for the brakes is also controllable by the system CS.

[0039] The drawworks control system 50 has a housing 51 with a cable connector 52 for optional wired use of the system 50 and an emergency pushbutton 53 to push to stop the drawworks in an emergency. The connector 52 may also be used to connect a cable for programming devices of the system 50 to change system batteries; or to program system displays. An ON/OFF switch 54 controls power to the system 50. Power is provided by a battery 5T mounted inside the remote control housing 51. A pushbutton 55 starts the drives 36 that provide power to the drawworks. A light 56 indicates whether the system 50 is ON (light lit) or OFF (light off).

[0040] Mast raising is conducted with a transmission 37 of the drawworks, an internal component of the drawworks, in low gear and with a system Baylor brake 38 off. The switch 57 is switched to control the rig control system to switch the transmission 37 into low gear and the switch 58 is switched to switch the clutch 37a of the transmission 37 to a low clutch setting. A switch 59 controls the system CS to set and release the Baylor brake.

[0041] Switches 61, 62 control the system CS to turn ON pumps of the cooling system CT that supply cooling water to the brakes. Lights 61a, 62a indicate if the pumps are ON. A light 64 indicates when ON that the drawworks is ready to move the mast, e.g., that the radio connection is set with good coverage, the drawworks is powered, and the remote control system 50 is in full control of the components. A switch 63 controls the system to place the drawworks in Forward (raise mast) or Reverse mode (lower mast). Lights 63a (Forward mode) and 63b (Reverse mode) indicate the mode of the drawworks.

[0042] A throttle knob 65 controls the system CS to control the DC current to the drawworks motor M.

[0043] Lights 66 indicate battery status of a battery BT. A light 67 indicates if ON that the emergency brakes are being applied. A light 68 indicates whether air being supplied to the drawworks to operate the clutch and transmission is at a sufficient level (e.g. appears green). If this light appears red, this is an indication that the air pressure is too low.

[0044] The display 71 displays the rig’s hook load (e.g. in thousands of pounds). The displays 72, 73 display the pressure of the drawworks brake system BS (in psi). Displays indicate pressure on the service brakes. The display 72 displays the pressure of the system’s “off driller side” disc brakes and the display 73 displays the pressure of the “driller side” brakes.

[0045] The display 74 displays the pressure in psi of hydraulic fluid from a rig hydraulic pressure unit HPU. This fluid powers the hydraulic drawworks brake system BS (but not the eddy current brakes). If this pressure goes below a pre-set level (e.g. 5000 psi) the park/emergency brakes are automatically applied.

[0046] Pushing a parking brake button 75 applies the hydraulic brakes of the brake system BS, stopping the drawworks, and bringing to a stop raising or lowering of the mast. A light 75a indicates whether the drawworks has been stopped by pushing the button 75.

[0047] A joystick 80 controls the service brakes and thus controls the speed of raising (and of lowering) the mast. In one aspect pushing forward on the joystick 80 (toward the top of FIG. 9) releases the service brakes, increasing the speed of raising (or of lowering) (arrow indicates “SERVICE BRAKE RELEASE” direction); or pulling back on the joystick decreases the speed. The joystick 80 has a deadman switch 81 which is pressed in order to release the brakes. If this deadman switch is not being pressed, the service brakes will be fully applied. Appropriate switches, e.g. switches 8A, 8B, and appropriate display(s), e.g. display 8C, are used in raising and lowering of a substructure (with corresponding devices and circuitry in the remote control system, as is true for all the functions of the remote control system).

[0048] In a typical operational sequence using the system 50, the switch 54 is turned ON. Optionally, an enable switch ES of the system CS (e.g. on a driller’s console DC) is activated so that the system 50 can take over.

[0049] Low/high gear, low/high clutch engagement, and the drawworks throttle controls at the system CS are disabled via relays in the control system and the driller’s joystick throttle control is also disabled. Once the system CS recognizes that the remote control system 50 is enabled, it will disregard the driller’s joystick throttle control and signals related thereto and follow the input from the joystick 80 of the system 50 and the remote control system 50 will have control of the drawworks speed. The control system CS receives a signal from the joystick 80 (from a radio receiver RR of the system 50).

[0050] A splitter barrier SB (installed in the rig control system 34) splits a hookload signal from a transducer TD of the system CS, providing a hookload indicating signal to the system CS and to the system 50. Two transducers TS, TE of the HPU unit provide feedback to the driller’s console DC. A splitter ST on each transducer provides signals to the system 50 indicative of the pressure on the brake system BS.

[0051] The driller can manually start the brake cooling pumps before commencing operations, or these pumps can be activated using the system 50.

[0052] A pressure switch PS for a rig air pressure measured next to the drawworks provides a digital signal to the system CS and to the system 50 and to the driller’s console DC indicating the level of the system air pressure. A pressure switch PR indicates the pressure applied to the park brake and provides a signal indicative of whether the park brake is set or released.

[0053] An encoder EC of the system CS indicates whether the drawworks is in Forward or Reverse mode, and at what speed. Feedback for the Baylor brake condition is provided by the system CS. Pressure switches PU, PE on the low gear and clutch air supply indicate whether the gear and clutch are engaged.

[0054] In one particular mast raising operation according to the present invention, SCR circuit breakers CB are closed and the drawworks control system is set to automatic. The rig
floor is cleared of all personnel. The operator of the system 50 starts the brake water cooling pumps. The operator of the system 50 engages the low gear and insures the low gear is engaged; he sets the drawworks to Forward; and checks that the READY light is ON. He then turns the knob 65 so that the drawworks motor begins running. He then verifies that the HPU pressure (display 74) is around 2000 psi and verifies that the brake pressure (displays 73, 74) is around 1200 psi. He checks that the rig air pressure light 68 is ON and verifies that the auxiliary brake controller is powered. The Baylor brake is tested by setting it off and on again from the remote control system 50; and its feedback is checked. The raising of the mast is commenced by engaging the clutch, beginning to release the service brakes of the brake system BS, and moving the joystick 80 forward.

[0055] The operator should see the pressure dropping on both displays 72, 73 and the light 63a should illuminate.

[0056] In emergency engagement of the park brake, the system cuts the pressure from the brake calipers and built-in springs activate the brake.

[0057] The present invention, therefore, provides in some, but not in necessarily all, embodiments a system for remotely controlling the raising and lowering of a drilling rig's mast, the system in certain aspects including a system for drilling operations, the system including: a drilling rig with a base; a mast movably connected to the base of the drilling rig; a drawworks system with cables for raising and lowering the mast, the cables connected to the mast; a drawworks control system for controlling the drawworks as the mast is raised or lowered; and a remote control system for remotely controlling the drawworks control system, the mast raisable and lowerable by a person spaced apart from the drilling rig using the remote control system. Such a system may include one or some, in any possible combination, of the following: the rig including a substructure, a floor on the substructure, apparatus for raising and lowering the substructure, and the remote control system for remotely controlling the apparatus for raising and lowering the substructure; wherein the mast is pivotably connected to the base and is pivotable on the base to achieve a raised position; wherein the drawworks system includes a brake system, the brake system remotely controllable using the remote control system; wherein the brake system includes an emergency park brake, an eddy current brake, and service brakes; wherein the brake system includes a cooling system, the cooling system remotely controllable by the remote control system; wherein the remote control system is battery powered by a battery; wherein the remote control system has ON/OFF apparatus for turning the drawworks on and off; wherein the drawworks system includes a transmission and a motor and the transmission is remotely controllable by the remote control system; wherein the drawworks is operable in a forward mode and in a reverse mode and the remote control system controls mode selection; wherein the motor is controllable by the remote control system; wherein the drawworks system includes a motor, a brake system, and a transmission, the brake system including service brakes, and the remote control system includes joystick apparatus for controlling the service brakes to control speed of movement of the mast during lowering and raising; wherein the remote control system includes a deadman switch on the joystick apparatus; display apparatus on the remote control system for displaying rig operational parameters; wherein the drilling rig includes a rig system with an enable switch for selectively enabling the remote control system; wherein the drilling rig includes a hookload indicating apparatus in communication with the remote control system; and/or wherein the drilling rig includes a brake system with a park brake and an air system for providing air to the park brake, and pressure indicating apparatus in communication with the remote control system for indicating the system air pressure.

[0058] The present invention, therefore, provides in some, but not in necessarily all, embodiments a method for remotely controlling a mast raising or lowering operation, the mast movably connected to a base of a drilling rig, the drilling rig including a drawworks system with cables for raising and lowering the mast, the cables connected to the mast, a drawworks control system for controlling the drawworks as the mast is raised or lowered, the method including: remotely controlling the drawworks system with a remote control system, the mast raisable and lowerable by a person spaced apart from the drilling rig using the remote control system; and, in one aspect, such a method wherein the remote control system is battery powered by a battery; and/or wherein the drawworks system includes a brake system, the brake system remotely controllable using the remote control system, the brake system including an emergency park brake, an eddy current brake, and service brakes, the remote control system including joystick apparatus for controlling the service brakes to control speed of movement of the mast during lowering and raising, the method further including using the joystick apparatus to control the service brakes to control speed of movement of the mast during lowering and raising.

[0059] In conclusion, therefore, it is seen that the present invention and the embodiments disclosed herein and those covered by the appended claims are well adapted to carry out the objectives and obtain the ends set forth. Certain changes can be made in the subject matter without departing from the spirit and the scope of this invention. It is realized that changes are possible within the scope of this invention and it is further intended that each element or step recited in any of the following claims is to be understood as referring to the step literally and/or to all equivalent elements or steps. The following claims are intended to cover the invention as broadly as legally possible in whatever form it may be utilized. The invention claimed herein is new and novel in accordance with 35 U.S.C. §102 and satisfies the conditions for patentability in §102. The invention claimed herein is not obvious in accordance with 35 U.S.C. §103 and satisfies the conditions for patentability in §103. This specification and the claims that follow are in accordance with all of the requirements of 35 U.S.C. §112. The inventors may rely on the Doctrine of equivalents to determine the scope of their invention and of the claims that follow as they may pertain to apparatus not materially departing from, but outside of, the literal scope of the invention as set forth in the following claims. All patents and applications identified herein are incorporated fully herein for all purposes. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents, but also equivalent structures. Thus, although a nail and a screw may not be structural equivalents in that a nail employs a cylindrical surface to secure wooden parts together, whereas a screw employs a helical surface, in the environment of fastening wooden parts, a nail and a screw may be equivalent structures. It is the express intention of the applicant not to invoke 35 U.S.C. §112, paragraph 6 for any limitations of any of the claims herein, except for those in which the claim expressly uses the
words ‘means for’ together with an associated function. In this patent document, the word “comprising” is used in its non-limiting sense to mean that items following the word are including, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article “a” does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

What is claimed is:

1. A system for drilling operations, the system comprising a drilling rig with a base, a mast movably connected to the base of the drilling rig, a drawworks system with cables for raising and lowering the mast, the cables connected to the mast, a drawworks control system for controlling the drawworks as the mast is raised or lowered, and a remote control system for remotely controlling the drawworks control system, the mast raisable and lowerable by a person spaced apart from the drilling rig using the remote control system.

2. The system of claim 1 further comprising the rig including a substructure, a floor on the substructure, apparatus for raising and lowering the substructure, and the remote control system for remotely controlling the apparatus for raising and lowering the substructure.

3. The system of claim 1 wherein the mast is pivotably connected to the base and is pivotable on the base to achieve a raised position.

4. The system of claim 1 wherein the drawworks system includes a brake system, the brake system remotely controllable using the remote control system.

5. The system of claim 4 wherein the brake system includes an emergency park brake, an eddy current brake, and service brakes.

6. The system of claim 4 wherein the brake system includes a cooling system, the cooling system remotely controllable by the remote control system.

7. The system of claim 1 wherein the remote control system is battery powered by a battery.

8. The system of claim 1 wherein the remote control system has ON/OFF apparatus for turning the drawworks on and off.

9. The system of claim 1 wherein the drawworks system includes a transmission and a motor and the transmission is remotely controllable by the remote control system.

10. The system of claim 9 wherein the drawworks is operable in a forward mode and in a reverse mode and the remote control system controls mode selection.

11. The system of claim 9 wherein the motor is controllable by the remote control system.

12. The system of claim 1 wherein the drawworks system includes a motor, a brake system, and a transmission, the brake system including service brakes, and the remote control system includes joystick apparatus for controlling the service brakes to control speed of movement of the mast during lowering and raising.

13. The system of claim 12 wherein the remote control system includes a deadman switch on the joystick apparatus.

14. The system of claim 1 further comprising display apparatus on the remote control system for displaying rig operational parameters.

15. The system of claim 1 wherein the drilling rig includes a rig system with an enable switch for selectively enabling the remote control system.

16. The system of claim 1 wherein the drilling rig includes hoist load indicating apparatus in communication with the remote control system.

17. The system of claim 1 wherein the drilling rig includes a brake system with a park brake and an air system for providing air to the park brake, and pressure indicating apparatus in communication with the remote control system for indicating the system air pressure.

18. A method for remotely controlling a mast raising or lowering operation, the mast movably connected to a base of a drilling rig, the drilling rig including a drawworks system with cables for raising and lowering the mast, the cables connected to the mast, a drawworks control system for controlling the drawworks as the mast is raised or lowered, the method comprising remotely controlling the drawworks control system with a remote control system, the mast raisable and lowerable by a person spaced apart from the drilling rig using the remote control system.

19. The system of claim 18 wherein the remote control system is battery powered by a battery.

20. A method of claim 18 wherein the drawworks system includes a brake system, the brake system remotely controllable using the remote control system, the brake system including an emergency park brake, an eddy current brake, and service brakes, the remote control system including joystick apparatus for controlling the service brakes to control speed of movement of the mast during lowering and raising, the method further comprising using the joystick apparatus to control the service brakes to control speed of movement of the mast during lowering and raising.