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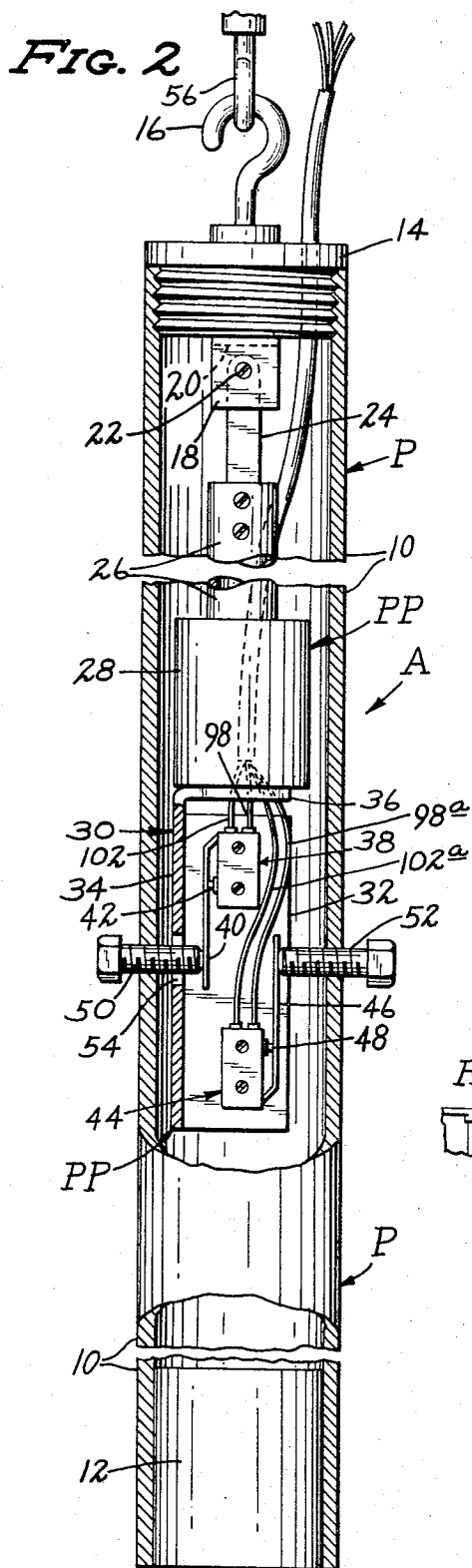
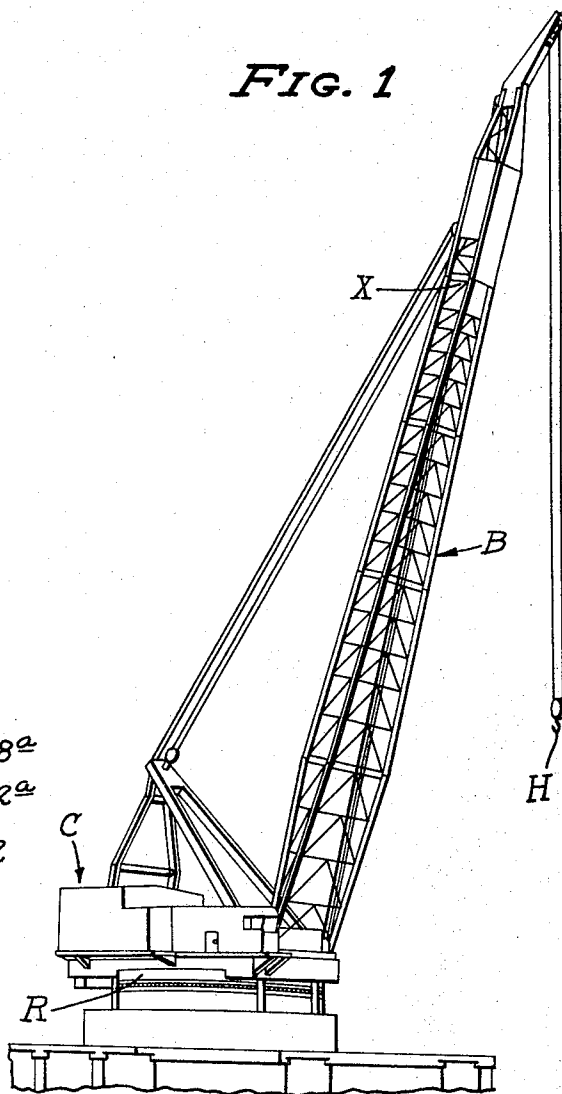
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3,365,076

DEVICE FOR STABILIZING THE HOOK SWING OF A CRANE BOOM

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2 Sheets-Sheet 1



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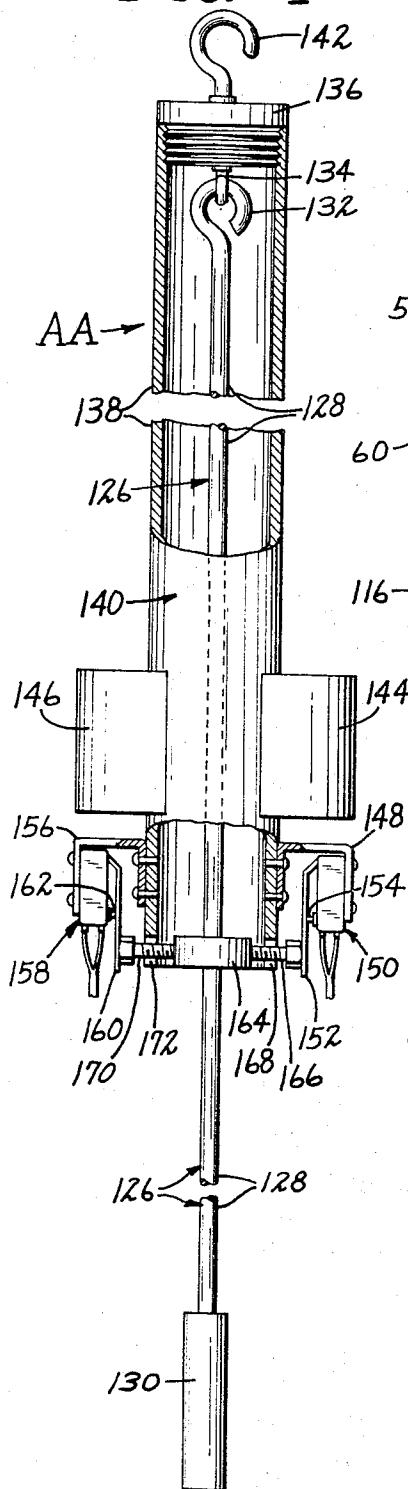
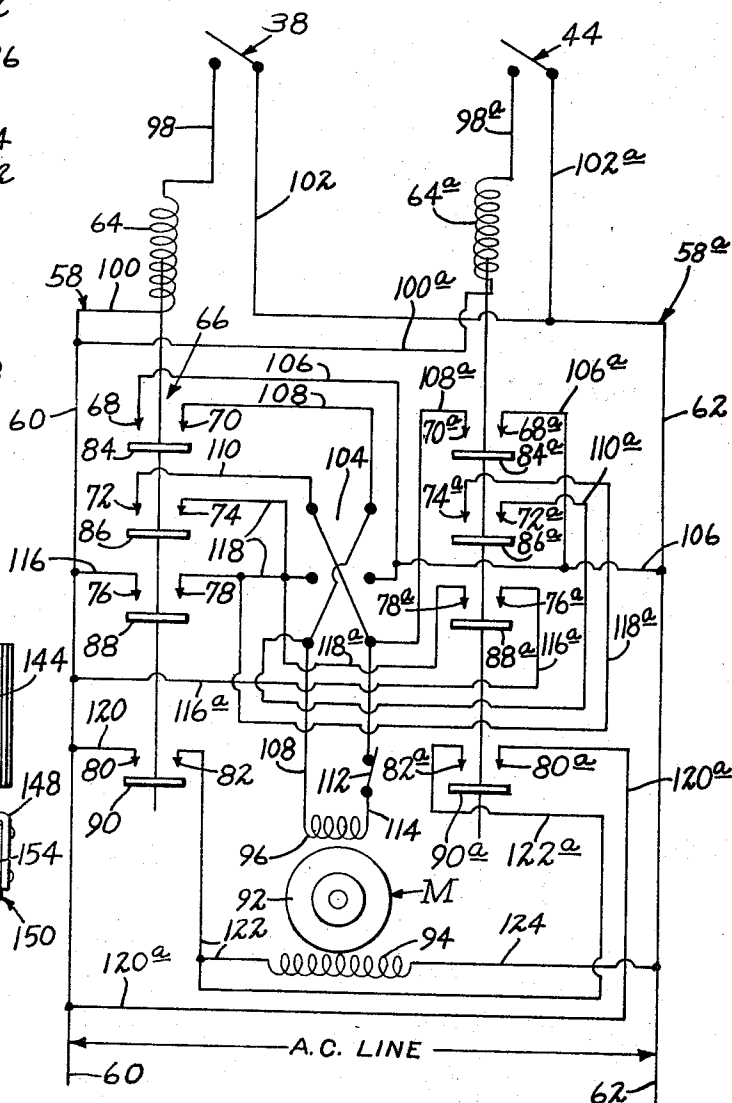
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FIG. 3



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DEVICE FOR STABILIZING THE HOOK SWING OF A CRANE BOOM

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8 Claims. (Cl. 212-39)

The invention relates broadly to an improvement in stabilizing devices and more particularly to a device for stabilizing the hook swing of the boom of a crane by acting upon the boom.

In the operation of a crane having a relatively long boom rotatable transversely upon a barge at sea, for example, the swing of the cable mounted hook over a load point on an off-shore drilling rig, for example, can increase to such an extent that loading must be stopped with resultant down time. The excessive hook swing is due to the pitching or rolling of the barge in the sea. The crane hook swings like a pendulum, and if the operator of the crane can observe the hook, he can manually compensate by rotating the boom in the opposite direction of the pendulum swing of the hook whereby the hook may be maintained over a given load point.

However, when the crane operator cannot observe the swing of the hook due to its extension over the high deck of a ship or off-shore drilling rig beyond his view, any great amount of hook swing prevents loading. This is particularly true where the length of the boom exceeds one hundred feet.

It is an object of the invention to provide a device for stabilizing the swing of the hook of the boom of a crane which acts upon the crane boom whereby the hook is automatically maintained substantially centered over a load point regardless of the movement of the crane. All the crane operator needs is an initial indication as to the position of the load point.

It will not be here attempted to set forth and indicate all of the various objects and advantages incident to the invention, but other objects and advantages will be referred to in or else will become apparent from that which follows.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings, showing by way of examples preferred embodiments of the inventive idea wherein like numerals refer to like parts throughout.

In the drawings forming part of this application:

FIGURE 1 is a perspective view of a crane of a type in which the stabilizing device is mounted.

FIGURE 2 is a side elevational view of one embodiment of the device, portions of which are in section, other portions being broken away.

FIGURE 3 is a circuit diagram illustrating one form of circuitry for actuating the turntable of a crane in conjunction with the operation of the stabilizer.

FIGURE 4 is a side elevational view of a further embodiment of the device, portions of which are in section, other portions being broken away.

Referring to the drawings in detail, the stabilizer A includes the elongated tubular member 10 which forms a long or primary pendulum P. The primary pendulum P acts as a support norm or perpendicular reference. Mounted in the lower end of the member 10 is the weight 12 which gives an added pendulum effect to the pendulum member 10. Also provided is the plug 14 which is threadedly engaged in the upper end of the member 10 and secured to upper outer end of the plug 14 is the hook 16.

Secured to the underside of the plug 14 and within the member 10 is the boss 18 formed with the slot 20. Pivotaly mounted within the slot 20 by means of the

pin 22 is the link 24. The lower end of the link 24 is rigidly secured to the upper end of the conduit member 26, and the lower end of the conduit member 26 is connected to the weight 28. The numeral 30 designates a bracket which includes a first vertical flat leg portion 32 from which extends at a right angle the second vertical flat leg portion 34. The leg portion 34 terminates at its upper end in the right angular short leg 36 which is secured to the lower end of the weight 28.

Mounted on the upper end of the bracket leg 32 is a first conventional normally open limit switch 38 having the contact arm 40 and the contact 42. Also mounted on the bracket leg 32 is a second conventional normally open limit switch 44 having the contact arm 46 and the contact 48. Threadedly mounted in the wall of tubular member 10 and extending thereinto is a first adjustment screw 50 which is in alignment with the contact arm 40 of the switch 38 and adjustable relative thereto. Also threadedly mounted in the wall of the tubular member 10 is a second adjustment screw 52 which is in alignment with contact arm 46 of the switch 44 and adjustable relative thereto. The adjustment screw 50 extends through the hole 54 formed in the leg portion 34 of the bracket 30.

The link 24 together with the conduit 26, the weight 28 and the bracket 30 act as a short pendulum PP pivotally mounted within the long or primary pendulum P which acts as a supporting norm or reference. Due to its length the short pendulum reacts more quickly to boom movement than the long pendulum P. The device A is pivotally hung by means of the hook 16 upon the eye 56 mounted in the upper end of the boom B of the crane C substantially at point X.

As an illustration of the operation of the device, let it be assumed that the boom B pitches one way, say to the left, facing FIGURE 2, the pendulum PP swings to the left and the arm 40 bears against the end of adjustment screw 50, thereby causing contact between arm 40 and contact 42, which closes the switch 38. FIGURE 3 illustrates one form of a control circuit usable in connection with the device. Operated by the switch 38 is a control circuit 58 energized by an A.C. line 60-62. This circuit 58 includes the coil 64 of a relay 66, the relay 66 further including three sets of fixed contacts 68-70, 72-74, 76-78, and 80-82. In addition, a number of movable contacts 84, 86, 88 and 90 are employed.

For operating the bull ring R of the crane by means of which the crane is rotated a motor M is employed which has a rotor 92, a running coil 94 and a starting coil 96. The motor M operates in either direction and reversal of the same is procured by reversing the connections of the starting coil 96 to the line 62.

One side of the coil 64 is connected by means of a conductor 98 to the switch 38, the other end of said coil is connected by a conductor 100 to the one side 60 of the A.C. line. The other terminal of switch 38 is connected by means of a conductor 102 to the other side 62 of the A.C. line.

The switches formed by the contacts 68-70-84, the contacts 72, 74 and 86, and the contacts 76, 78 and 88, form the equivalent of a double pole double throw switch which is diagrammatically indicated at 104. The contact 68 is connected by means of a conductor 106 to conductor 62. The contact 70 is connected by means of a conductor 108 to one end of the starting coil 96. The contact 72 is connected by means of a conductor 110 to one side of a manually operated switch 112 the other side of which being connected by means of a conductor 114 to the other end of the winding 96. The contact 76 is connected by a conductor 116 to the side 60 of the A.C. line. The contact 78 is connected by conductor 118 to the contact 74. The contact 86 is connected by means of a conductor 120 to the side 60 of the A.C. line. The contact 82 is connected by

means of a conductor 122 to the running winding 94 of the motor M while the other end of said winding is connected by means of a conductor 124 to the other side 62 of the A.C. line.

The switch 44 operates a control circuit 58a which is similar to the control circuit 58. In this circuit 58a the parts are identical with those in circuit 58 and will bear the same reference numerals followed by the lower case letter a. The connections of the various parts are the same as for those in circuit 58 except that the connections to the starting winding 96 are reversed. With this arrangement, switch 38 serves to operate the motor M with rotation in one direction and switch 44 serves to operate said motor in the opposite direction. For the purpose of illustrating the manner of reversing the direction of rotation of the bull ring R of the crane C to which the boom is connected one form of control circuit has been shown.

When the boom B pitches the opposite way, say to the right in FIGURE 2, the switch arm 46 of switch 44 bears against the end of adjustment screw 52, and through the control circuit 58a the motor M is rotated in the opposite direction thereby rotating the bull ring R in the opposite direction and consequently the boom is moved in the direction opposite to the pitch. Thus, with the device A the swing of hook H is compensated for, and the hook H is maintained over a load point.

A further embodiment of the invention is illustrated in FIGURE 4 wherein the stabilizer A includes the primary long pendulum 126 formed of the elongated rod body 128 which has secured to the lower end thereof the weight 130. The primary pendulum 126 acts as a support norm or perpendicular reference. Formed on the upper end of the pendulum 126 is the hook 132 which is connected to the eye 134 secured to the inside surface of the plug 136 threadedly mounted in the upper end of the tubular body 138 forming the secondary pendulum 140. Extending upwardly from the plug 136 of pendulum 140 is the hook 142. Secured to the pendulum 140 adjacent the lower end thereof are the weights 144 and 146.

The numeral 148 designates a first bracket connected to the lower end of the pendulum body 138 and secured to the first bracket is a first switch 150 having the switch arm 152 and contact 154. A second bracket 156 is connected to the lower end of the pendulum body 138, and secured to the second bracket is a second switch 158 having the switch arm 160 and contact 162.

Further provided is the support disc 164 secured to the rod body 128 of the long pendulum 126, and threadedly mounted on the support 164 is the first adjustable extension in the form of a bolt 166. The bolt 166 extends from the support through an opening 168 formed in the wall of the pendulum body 138 and the head of the bolt is in alignment with the switch arm 152 for contact therewith. Threadedly mounted on the support 164 is a second adjustable extension in the form of a bolt 170. The bolt 170 extends from the support through an opening 172 formed in the wall of the pendulum body 138 on a diameter with opening 168.

Due to its length, the short pendulum 140 has a period or reaction whereby the same reacts more quickly to boom movement than the long pendulum 126. The device AA is pivotally hung by means of the hook 142 upon an eye mounted in the upper end of the boom B of the crane C substantially at point X. The device AA is hooked into one form of control circuit as in FIGURE 3 as in the case of the device A described above, the switch 150 substituted for switch 38 and the switch 158 substituted for switch 44. With the device AA let it be assumed that the boom B pitches one way say to the left facing FIGURE 4, the pendulum 140 swings to the left, and the switch arm 152 is caused to bear against the bolt 166 which effects contact with contact 162 thereby closing the switch 150. As a result the motor M is rotated

which rotates the boom through the bull ring R to the right. Similarly if the boom B pitches to the right the pendulum 140 swings to the right, and the switch arm 160 is caused to bear against the bolt 170 which effects contact with contact 154 thereby closing the switch 150. As a result, the motor M is rotated in the opposite direction which rotates the boom through the bull ring R to the left. Thus, through alternate compensating movement of the boom, the swing of the cable mounting the hook H is dampened whereby the hook is maintained over a given point.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

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

1. A stabilizing device for damping the swinging movement of a crane hook by rotating the boom of the crane, said device comprising:

- (a) a primary pendulum adapted to be pivoted to said boom as a vertical reference and to swing in opposite directions,
- (b) a secondary pendulum pivoted to said boom to swing in the same directions,
- (c) one of said pendulums being shorter than the other to produce relative movement therebetween, and
- (d) actuating means depending upon the relative movement of said pendulums for controlling the hook swing movement of the boom.

2. The device of claim 1 in which,

- (a) said longer pendulum is tubular in form, and
- (b) said shorter pendulum is pivotally mounted to swing within said longer pendulum.

3. The device of claim 2 in which,

- (a) said actuating means includes first and second switch means carried by said secondary pendulum, and
- (b) first and second extension means extending from said primary pendulum adapted to actuate said first and second switch means, respectively, when said secondary pendulum is caused to swing.

4. The device of claim 3 in which,

- (a) said first and second extension means are each adjustable relative to said first and second switch means, respectively.

5. The device of claim 4 in which,

- (a) said secondary pendulum includes weight means connected thereto, and
- (b) said primary pendulum includes weight means connected thereto.

6. The device of claim 1 in which,

- (a) said shorter pendulum is tubular in form, and
- (b) said longer pendulum is pivotally mounted to swing within said shorter pendulum.

7. The device of claim 6 in which,

- (a) said actuating means includes first and second switch means carried by said secondary pendulum, and

- (b) first and second extension means extending from said primary pendulum adapted to actuate said first and second switch means, respectively, when said secondary pendulum is caused to swing.

8. The device of claim 7 in which,

- (a) said first and second extension means are each adjustable relative to said first and second switch means, respectively.

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