

# United States Patent

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[56]

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[54] **MEANS FOR KEEPING THE POSITION OF A SHIP  
 CONSTANT DURING MOORING**  
**5 Claims, 4 Drawing Figs.**

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 254/172  
 [51] Int. Cl. .... B63b 21/00  
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 114/230, 144 B

**ABSTRACT:** In order to keep a ship in constant position when moored at a quay, one or more mooring winches are mounted fore and aft of the ship and connected to fixed points on the quay. A pillar on the quay is engaged by a forked rod pivoted at the side of the ship. Pivoting of this rod by any movement of the ship operates a control device which sets one or the other of the winch motors in operation so as to restore the ship in its original position.

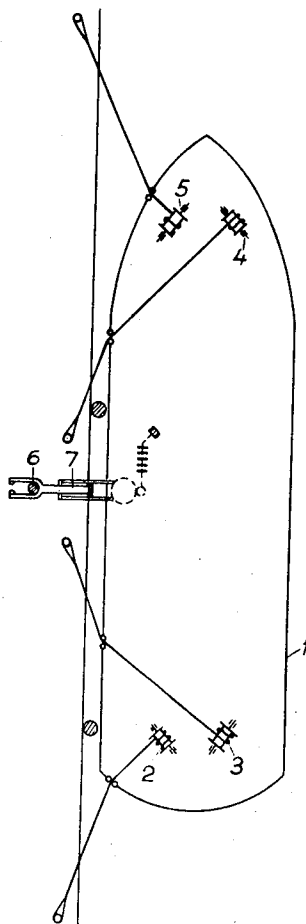


Fig. 1

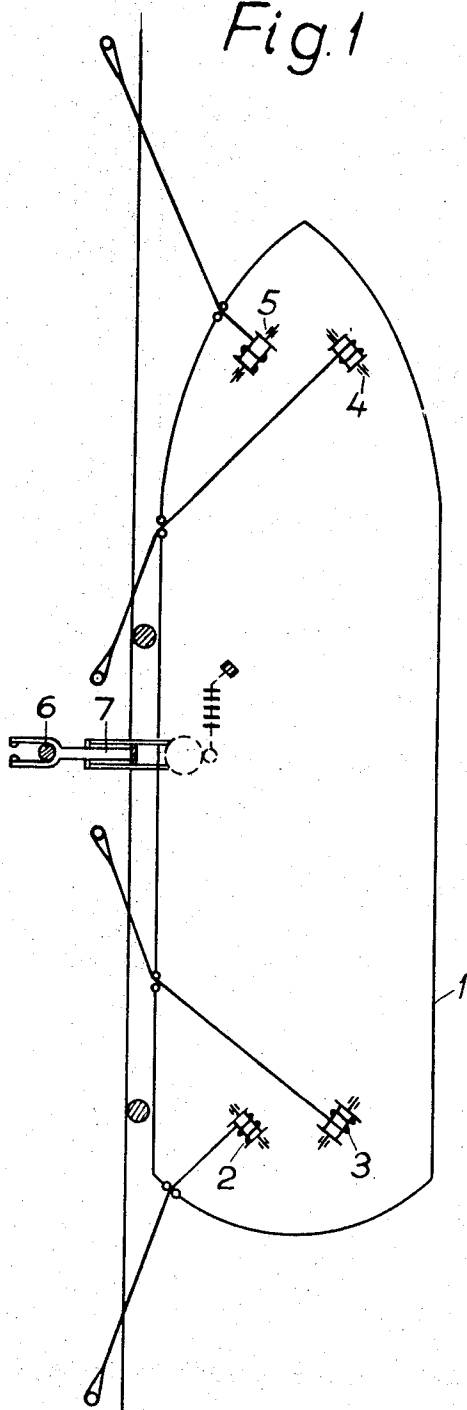
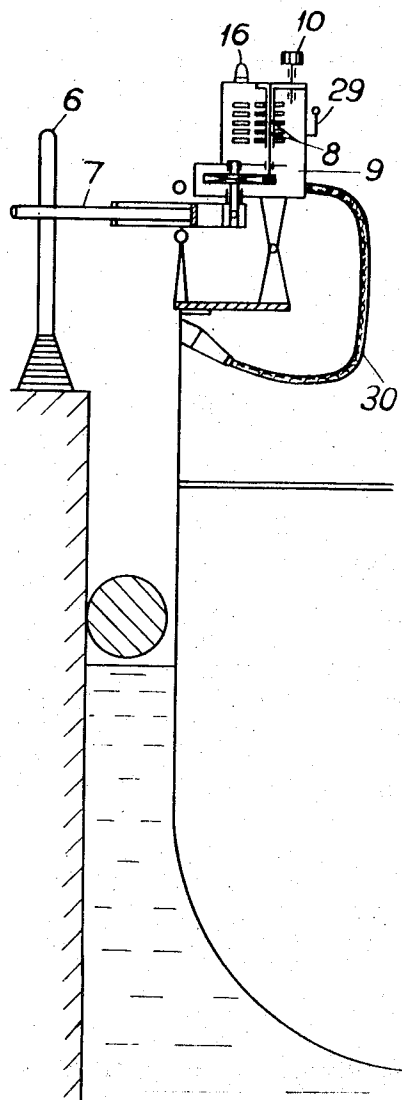


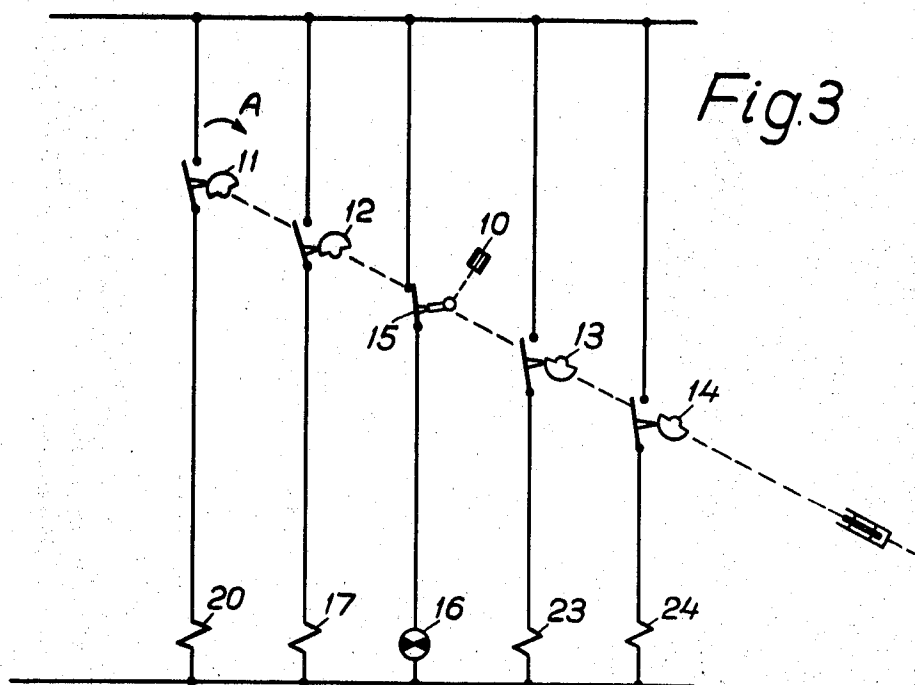
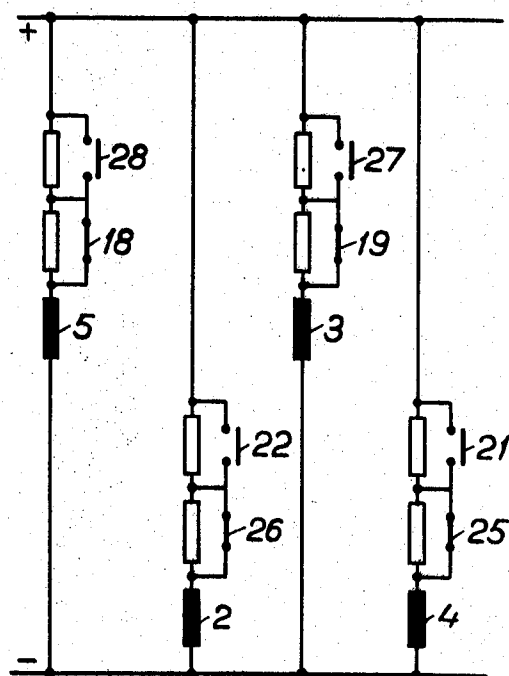
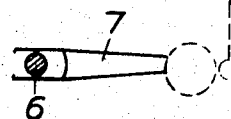
Fig. 2



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## MEANS FOR KEEPING THE POSITION OF A SHIP CONSTANT DURING MOORING

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates to a means for keeping the position of a ship constant during mooring.

#### 2. The Prior Art

While loading and unloading ships it is desirable for the ship to remain in a constant position and for deviations from this position, for example caused by propeller suction or some other disturbance from passing ships, high seas, currents, etc., to be rapidly corrected. There may, for example, be stationary loading arrangements on shore to transport goods, containers, etc. to the exact position desired on board, or program-controlled harbor or ship cranes which operate from a fixed starting position. It is therefore of great importance that the position of the ship in relation to the quayside does not noticeably alter. It must also be possible to change quay position so that the ship is moored at a new, precisely fixed position. However, the ship must also be moored so that alterations in level, for example in response to tides, can take place without sideways alterations in position.

### SUMMARY OF THE INVENTION

According to the invention these problems have been solved and there are provided at least one mooring winch fore and one aft of the ship in question. The invention is characterized in that at the side of a ship is applied a member for cooperation with a stationary point on the quay, or vice versa, which member is arranged to drive at least one program device which in different turning positions connects different winch motors in order to keep the ship in a certain position with respect to the quay.

The winch motors may of course even be positioned on shore, likewise the sensing member in that case operating at a point on the ship. Such an arrangement in its various alternative forms enables rapid compensation upon sudden position alterations sideways and enables a rapid and effective loading and unloading of a ship with a minimum of labor.

In a preferred embodiment of the invention at least two winches are positioned on the ship (or on the quay) fore and at least two winches after, one of each operating fore and aft. These winches are program-controlled according to the above and an extra rapid correction of the position of the ship in relation to the quay is thus obtained. The member controlling the program device may consist of a fork, a rod or the like, cooperating with a stationary point on the quay or vice versa. Such stationary points may be positioned at various points in a harbor at different loading positions. In certain cases the means for driving the program device may be replaced by a photocell cooperating with a mark on the quay or vice versa, or an electromagnetic device operating in a corresponding manner.

### BRIEF DESCRIPTION OF THE DRAWINGS

The invention is further explained in the accompanying drawings in which

FIG. 1 shows a moored ship,

FIG. 2 a side view of the program-control device,

FIGS. 3 and 4 relay diagram and field circuit diagram, respectively, for the various winch motors.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a ship 1 moored by a quay. The ship is kept in position by four mooring winches 2, 3, 4 and 5, each driven by DC or AC motors, hydraulic motors or steam-powered motors. In the DC case the motors are fed by a DC generator or by means of thyristor-feeding from an AC network. Transducer-control may also be connected in the feeding circuit.

The winches 3 and 5, positioned aft and fore, respectively, operate in the forwards direction and the winches 2 and 4, also

positioned aft and fore, respectively, operate in the reverse direction. It is of course also possible to place the winches on the quayside and attach the wires on the ship.

On the quay is a pillar 6, an anchoring capstan, a ring or the like and in loose engagement with this is a forklike member 7, pivotably arranged at the side of the ship. The arm 7 may be telescopic. (Corresponding arrangements may also be arranged on the starboard side if the ship is moored on that side.) For various reasons the ship may be turned or moved along the quay and a completely rigid mooring arrangement is not technically advisable. A desired neutral position must, however, be maintained in order to facilitate loading and unloading.

When the ship moves, the forklike member 7 is turned, and thus a program device 9 mechanically connected to this (or via selsyn devices), for example in accordance with British Pat. No. 1,178,456. The program device consists of a central shaft 8 and cam discs cooperating with electric contacts, hydraulic valves or other types of valves or the like to regulate the torque of the winch motors. The cam discs may be replaced by electric connecting devices operating in different turning positions for the shaft 8.

An adjustment means for zero position is also arranged on the program device 9. When the ship is in exactly the position desired the shaft 8 is turned (or the cam discs via another shaft) by means of the knob 10 until an indicator 16 marks that the program device is at zero position, i.e., all the winch motors develop the same torque. The ship is kept a certain distance from the quay by conventional means (see FIG. 2).

FIG. 3 shows the zero-adjusting device 10 by which the cam discs 11, 12, 13, 14 are turned to neutral position at which the switch 15 is closed and the indication lamp 16 ignites. When, for instance, the ship is in the desired neutral position, the zero-adjusting wheel 10 and cam discs 11-14 are turned until the central position is reached and the switch 15 closes.

The cam discs 11-14 are turned by means of the forklike member 7 (FIG. 3) in one direction or the other, for example upon movement according to the arrow A, so that after a certain movement for example cam disc 12 closes a circuit for a relay coil 17 so that the contacts 18 and 19 break (FIG. 4) and series resistance is connected in the field circuits of the winch motors 5 and 3. The tensile force in these motors is then reduced and the tensile force aft is increased since the winch motors 2 and 4 maintain their original tensile force. Upon further turning in the direction of arrow A, the switch at cam disc 11 is also closed, the relay coil 20 obtains current and its contacts 21 and 22 are closed. The series resistance in the field circuits of the motors 2 and 4 is short-circuited and the tensile force of these motors increases so that the resultant tensile force aft increases and endeavours to return the ship to neutral position.

During these movements the cam discs 13 and 14 remain open, but upon movement aft from the neutral position, the contacts close in turn at these cam discs. Upon current through the relay coil 23 (the contacts at 11 and 12 are now open and the contacts 18, 19, 21 and 22 are in the position shown in FIG. 4) the contacts 25 and 26 are opened and the tensile force in the winch motors 2 and 4 becomes weaker. If there is current in the relay coil 24, the contacts 27 and 28 are closed and the tensile force in the winch motors 5 and 3 increases so that a resultant tensile force is obtained forwards.

Similarly, with separate generators in a Ward-Leonard unit, the field in the generators for the different DC winch motors can be regulated or the control circuits to thyristors or transducers with DC motors can be fed in a corresponding manner. Hydraulic motors can be controlled via different hydraulic valves by the cam discs 11-14 as above. Changeable-pole motors can also be used which are connected with the help of the cam discs 11-19.

The program device 9 may be supplemented by a manual control arm (FIG. 1) 29 for manual control of the winches. 30 is a connection cable from the program device, which can be lowered when not in use.

It is important with the invention that the program device is not influenced in different levels vertically. As mentioned, it must be possible to move the ship between different loading points and then after zero (neutral) adjustment once again use the automatic positioner. It is also obvious that the number of control stages can be varied and that the control can be made substantially continuous, for example by means of a potentiometer connected in control circuits of the thyristors or transducers.

The member 7 may be replaced by photocells which, by means of suitable sweeping devices, sense the position of a stationary mark on the quay and in accordance with this set the corresponding turning position for the program device. The photocell may also be stationary, suitably sever photocell devices in different fixed positions, and emit impulses to the driving member for the program control device when the ship moves. In the same way electromagnetic sensing devices can be arranged.

The number of winch motors may be two, four, six and upwards.

We claim:

1. In connection with a quay element and a ship element, means for keeping the position of the ship element constant with respect to the quay element during mooring, comprising at least one mooring winch fore and at least one aft of the ship carried by one of said elements, a member movably mounted on one of said elements at the side of the ship adjacent the quay for cooperation with a stationary point on the other ele-

ment and responsive to relative movement between the elements, at least one program device operatively connected to said movable member and responsive to movement thereof to assume different turning positions to control the torques of the winch motors, whereby to keep the ship element in a certain position with respect to the quay element.

2. In an arrangement according to claim 1, the program device comprise cam discs, control circuits for the winch motors, control elements in the control circuits operatively engaging said cam discs, said cam discs being connectable in different turning positions to said movable member, whereby different torque is set for the winches at different turning angles.

3. In an arrangement according to claim 1, the program device being provided with an adjusting member for the desired neutral position of the ship.

4. In an arrangement according to claim 1, comprising at least four winch motors, one pair situated fore and the other pair aft, one of the motors of each pair operating fore and the other aft, wherein when the ship moves forward the fore-operating torque is decreased and the aft-operating torque is increased, and vice versa when the ship moves backward.

5. In an arrangement according to claim 1, the movable member comprising an elongated member on the ship element cooperating with a stationary member on the quay element, whereby when the ship element moves along the quay element the program device will be turned.

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