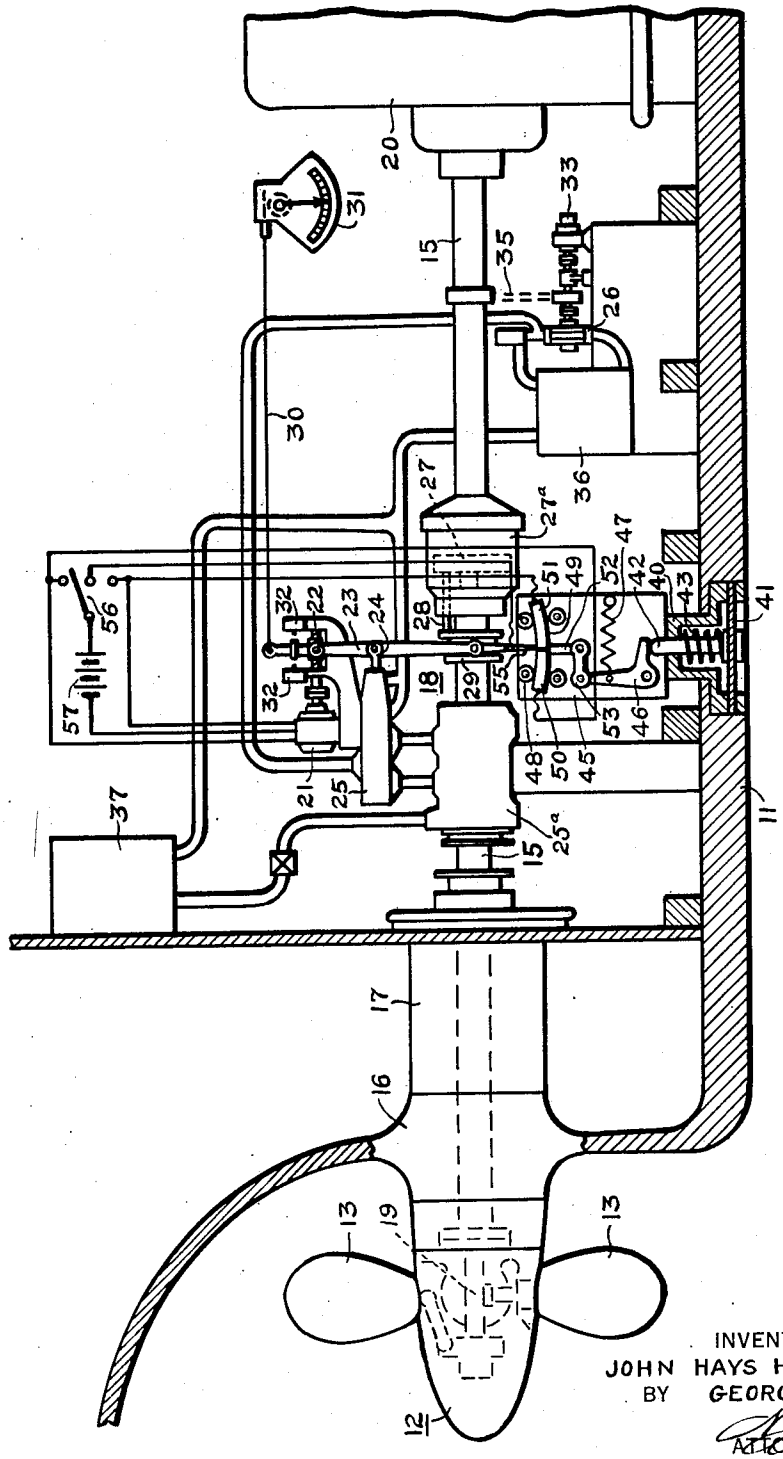
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VARIABLE PITCH PROPELLER CONTROL

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INVENTOR
JOHN HAYS HAMMOND, JR.
BY GEORGE A. COLLEY.
ATTORNEY

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VARIABLE PITCH PROPELLER CONTROL

John Hays Hammond, Jr., Gloucester, and George A. Colley, Newton Center, Mass.; said Colley assignor to said Hammond

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This invention relates to variable pitch propellers and more specifically to means for varying the pitch of a propeller in proportion to the draft or loading of a vessel so that the proper pitch for the power requirements of the vessel is automatically attained.

The invention further relates to a hydrostatically operated mechanism which directly controls means for varying the pitch of the propeller blades in proportion to the depth of submergence of the mechanism which may be located on the keel of the vessel.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description, taken in connection with the accompanying drawing forming a part thereof, in which the single figure illustrates diagrammatically the system as applied to the driving mechanism of a marine vessel.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Referring to the accompanying drawing, the hull of a marine vessel is indicated at 11. This vessel is driven by means of a propeller 12 which is provided with adjustable blades 13. The propeller 12 is attached to the end of a hollow shaft 15 which passes through an outboard bearing 16 and a thrust bearing 17. The shaft 15 is driven by a prime mover 20 which may be of any desired type and is preferably provided with a governor, not shown, for maintaining a constant speed of rotation.

The blades 13 are connected to a variable pitch mechanism 18 which may be of any well known and standard construction, such as that manufactured by the Escher-Wyss Company of Zurich, Switzerland, the details of which form no part of the present invention and are accordingly not specifically set forth herein. This mechanism, in general, comprises a rod 19 slidable longitudinally within the shaft 15 and connected to control the pitch of the blades 13. The rod 19 is actuated by a piston 27 in a fluid pressure cylinder 27a. Fluid for actuating the piston 27 is supplied by a pump 26 through a control valve 25 and a distribution valve 25a which communicates with the cylinder 27a through ducts, not shown, in the shaft 15. A motor 21 rotates a worm 22 which operates to move the upper end of a floating lever 23, which, in turn, is pivoted to the end of a valve rod 24 which controls the valve 25. The piston 27 is connected by a rod 28 to a collar 29 which is slidably mounted on the shaft 15 and engages the lower end of the lever 23 so that the position of this end of the lever corresponds to the pitch of the blades 13.

The upper end of the lever 23 is connected by a wire 30 to an indicator 31 which shows the pitch at which the blades 13 are set. Stops 32 are provided for limiting the maximum and minimum pitch of the blades 13. The fluid pump 26 is driven either by a motor 33 or a belt 35 from the shaft 15. A reservoir 36 and a supply tank 37 are provided for the necessary fluid.

It is to be understood that other pitch control devices may be employed in place of that referred to above, for varying the pitch of the propeller blades 13 in response to actuation of the motor 21. A particular type is shown for purposes of illustration only.

In accordance with the present invention pressure actuated means is used to control the operation of the motor 21. In the embodiment shown this comprises a bell shaped casing 40 mounted in the hull 11. Over the mouth of the casing 40 is a flexible diaphragm 41 the lower surface of which is in contact with the water surrounding the hull 11. Attached to the diaphragm 41 is a rod 42 which extends up through an opening in the casing 40. Positioned between the top of the casing 40 and the diaphragm 41 and surrounding the rod 42 is a compression spring 43 which acts to counterbalance the hydrostatic pressure of the water against the diaphragm 41.

Attached to the top of the casing 40 is a plate 45 to which is pivoted an L shaped lever 46 one arm of which is held in contact with the top of the rod 42 by means of a spring 47. Rotatably mounted on the plate 45 are four rollers 48 made of insulating material. Located between these rollers is a segmental member 49 constructed of two segments 50 and 51 of conducting material and separated by a strip of insulation. Attached to the member 49 is an arm 52 the lower end of which is connected by a link 53 to the upper end of the lever 46. Secured to but insulated from the lever 23 is a brush 55 which engages the member 49. The

brush 55 is connected to the center contact of a three position switch 56, the blade of which is connected to a battery 57, the other side of which is connected to the common lead of the reversing windings of the motor 21. The segment 50 is connected to the upper contact of the switch 56 and to one reversing winding of the motor 21 and the segment 51 is connected to the lower contact of the switch 56 and to the other reversing winding of the motor 21.

Operation

In the operation of the invention the vessel is shown as being about half loaded so that the hydrostatic pressure on the diaphragm 41 is sufficient to move it to a median position, which, by means of the rod 42, lever 46, link 53 and arm 52, causes the member 49 to assume a central position. The propeller blades 13 are then set by moving the blades of the switch 56 into the upper or lower position which will cause the motor 21 to move the lever 23 to the right or left to decrease or increase the pitch in a well known manner until the brush 55 rests on the insulation between the segments 50 and 51. The blade of the switch 56 is then moved into engagement with the center contact. The blades 13 of the propeller 12 will then be set at the proper pitch for this loading as indicated by the pointer of the indicator 31.

If the loading of the vessel should now be increased the hull 11 will sink deeper in the water and the hydrostatic pressure on the diaphragm 41 will be increased, thus compressing the spring 43 and causing the rod 42 to move upward, thus rotating the lever 46 in a counter clockwise direction against the action of the spring 47. The member 49 will be moved to the left by means of the link 53 and arm 52 so that the segment 51 will be moved into engagement with the brush 55. This will close a circuit from the battery 57, switch 56, brush 55, segment 51 to the motor 21 thus causing the motor to rotate the worm 22 to move the upper end of the lever 23 to the right. This will move the valve 24 to the right which will allow fluid under pressure to pass from the pump 26 to the cylinder 27*a* by means of the ducts in the shaft 15. This will actuate the piston 27 which, by means of the rod 19 and the link mechanism, will cause the propeller blades 13 to decrease their pitch. At the same time the lower end of the lever 23 will be moved to the left under the action of the rod 28 and collar 29 until the brush 55 moves onto the insulation between the segments 50 and 51, thus stopping the motor 21.

If the loading of the vessel is decreased the reverse action will take place as the hydrostatic pressure on the diaphragm 41 will be lessened and the spring 43 will cause the pin 42 to move downward, thus causing the member 49 to be moved to the right. This will close a circuit through the segment 50 which will cause the motor 21 to rotate so as to move the upper end of the lever 23 to the left, thus increasing the pitch of the propeller blades 13 until the brush 55 has moved onto the insulation between the segments 50 and 51, thus stopping the motor 21.

It is thus seen that the pitch of the propeller blades 13 will be determined by the hydrostatic pressure on the diaphragm which in turn is proportional to the loading or draft of the vessel. In this way when the vessel is heavily loaded the pitch of the propeller blades will be small and when it is lightly loaded the pitch of the blades will be large, thus causing the propeller to operate at its most efficient pitch for the various power requirements occasioned by the condition of loading.

Although only a few of the various forms in which this invention may be embodied have been shown herein, it is to be understood that the invention is not limited to any specific construction but may be embodied in various forms without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In a system for driving a water borne vessel the draft of which is proportional to the load, a propeller having blades, means controlling the pitch of said blades, means responsive to the draft of said vessel, and means actuated by said draft responsive means to cause said control means to vary the pitch of said blades in accordance with the power requirements at the different drafts.

2. The system set forth in claim 1 in which the propeller is driven at constant speed.

3. The system set forth in claim 1 in which the draft responsive means comprises a member actuated by hydrostatic pressure.

4. The system set forth in claim 1 in which the draft responsive means comprises a diaphragm actuated by hydrostatic pressure.

5. The system set forth in claim 1 in which the draft responsive means comprises a member actuated by hydrostatic pressure and located at the lower part of the hull of said vessel.

JOHN HAYS HAMMOND, JR.
GEORGE A. COLLEY.