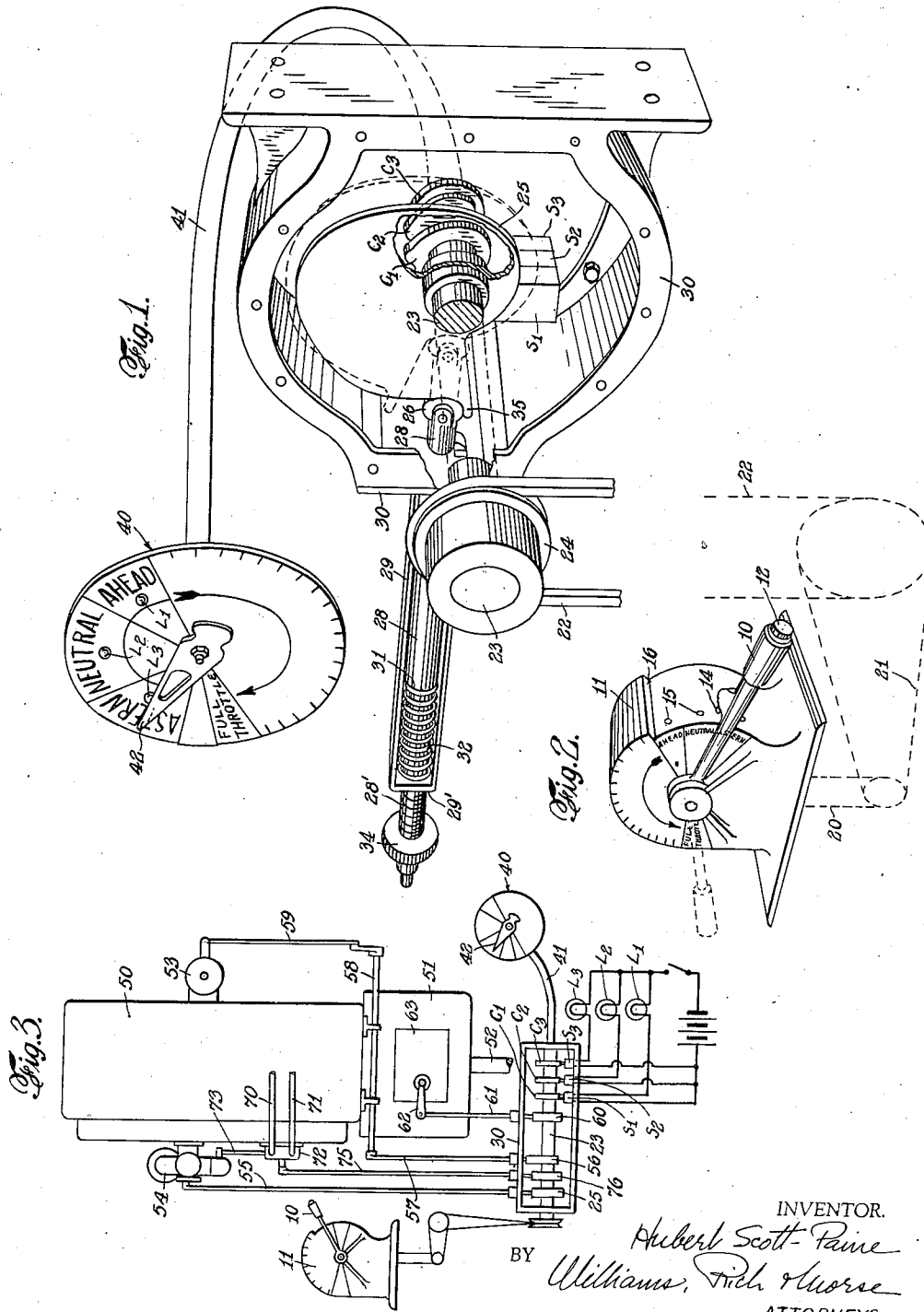


Sept. 28, 1943.

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ENGINE CONTROLLING MEANS
Filed Dec. 11, 1941

2,330,388



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UNITED STATES PATENT OFFICE

2,330,388

ENGINE CONTROLLING MEANS

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Application December 11, 1941, Serial No. 422,469

1 Claim. (Cl. 74-472)

This invention relates to engine control, more particularly to the control by the pilot of a boat of a power plant therefor comprising an internal combustion engine.

Of recent years vessels weighing between twenty and thirty tons have been developed with speeds approximating sixty miles per hour and driven by engines of considerable power. These craft are designed principally for war purposes as motor torpedo boats, submarine chasers and the like. In addition to travelling at a high speed such craft must also be capable of rapid manoeuvring.

Vessels of such size and power of necessity have their power plants located in an engine room remote from the bridge where the pilot takes his position. Under such circumstances it has usually been the practice to have the engines operated by an engine room crew according to directions from the bridge transmitted over one or more engine room signalling devices of one kind or another. This has necessarily involved some delay due to the time required to transmit the signals and for the carrying out of the indicated orders. The necessity of manoeuvring these craft at the high speeds of which they are capable makes it desirable, however, that the control of the engine be given directly to the pilot, particularly the control of the engine throttle, so that he may manoeuvre the vessel independently, without reliance on the operation of engine controls by the engine room crew. At the same time it is desirable that the engine room crew be informed as to the nature and extent of the controls initiated by the pilot so that they can check on the operation of the machinery and, if need be, independently carry out the operations desired by the pilot in case of any breakdown of or damage to the control apparatus. It is also within the contemplation of the invention that the pilot shall have sufficient direct control of the engine to manoeuvre the vessel, while relying on the engine room crew to have partial control of the engine in response to signals given automatically by the manipulation of the pilot's control.

It is the principal object of this invention to provide a simple and effective device which places the engine of a vessel directly under the control of the pilot, thus enabling him personally to manoeuvre the vessel without dependence upon others.

A further object is to incorporate in such a control device signalling means which will advise the engine room crew of the operations intended by the pilot.

Other objects are: to limit the speed of the engine when the vessel is being driven astern or when the engine is disengaged from the propeller shaft; to enable the engine room crew to

limit the maximum speed of the engine independently of the pilot's control; to provide means whereby a number of the controls necessary to the operation of an engine may be effected by the movement of a single lever or equivalent control means; and to provide means whereby certain movements of a throttle control cannot be made without giving signals to the engine room calling for appropriate action on the part of the engine room crew.

It is to be understood that reference to an engine is not intended to preclude the use of a plurality of engines, which may be simultaneously controlled by a single means or individually controlled by separate means, as hereinafter described.

To enable those skilled in the art to understand how the invention is to be practiced the present preferred embodiment thereof will now be described by way of illustration, taken in conjunction with the drawing in which:

Fig. 1 is a perspective view, partly broken away, of a cam box, and certain parts associated therewith, for controlling the engine and operating signals;

Fig. 2 is a perspective view of a pilot's control lever by which the engine is controlled and signals are given;

Fig. 3 is a diagrammatic representation of an engine showing the application thereto of the control means of the invention and the combination therewith of engine room signals.

Referring to the drawing, a pilot's control lever 10 is mounted for rotation on a control box 11 which may be conveniently mounted on the bridge. Lever 10 may be provided with a push button 12 actuating a spring operated detent 14 which engages with recesses 15 and shoulder 16 of box 11. Preferably the recesses 15 are shallow so that the lever can be moved past them without depressing button 12 but the shoulder 16 is of such height that positive operation of the detent is required to pass it. Suitable indicia on the box 11, such as "Astern," "Neutral," "Ahead" and "Full throttle" designate the controls effected. The sector between "ahead" and "full throttle" governs the range of forward speeds and may be suitably marked to indicate approximate R. P. M. or M. P. H. The shoulder 16 serves as a stop preventing unintentional opening of the throttle to higher forward speeds.

The lever 10 actuates any suitable driving gear 20, 21, 22, shown diagrammatically, such as cables, chains, shafting, belts or the like, which transmits the motion of lever 10, with or without being geared up or down, to a cam shaft 23. As shown in Fig. 1, a pulley 24 is fixed on the cam shaft and is driven by the belt 22. In the device illustrated the motion of lever 10 is geared up slightly so that for the full swing of the lever, which is about

200°, the cam shaft rotates through nearly a full circle.

On the shaft 23 is fixed a throttle controlling cam 25 against the face of which bears the roller 26 of a cam-follower 28 which is slidably mounted in a fixed bracket 29 secured to the outside of the cam box 30. The end of the follower 28 is reduced in diameter, as seen at 28', outwardly from the shoulder 31 against which presses the compression spring 32. This spring urges the follower against the cam so that it reciprocates as cam 25 is rotated. A limiting nut 34 may be provided on a threaded section of the follower for limiting its inward movement by the abutment of the nut against the end 29' of the bracket 29. In the structure shown, the inward movement of the cam follower 28 (toward the cam shaft 23) is intended to open the throttle and the outward movement to close it. Therefore, the nut 34 may be used to limit the maximum throttle opening and maximum speed.

The position of the parts shown in Fig. 1 corresponds to full speed astern, the roller 26 abutting the stop 35 on the cam. As cam 25 is rotated counterclockwise from the position shown in Fig. 1 the throttle is progressively closed to minimum speed corresponding to the "neutral" position of lever 10. This requires about a sixth of a revolution of shaft 23. Further rotation opens the throttle to the position corresponding to the "ahead" position of lever 10 and beyond that point the throttle is gradually opened through the entire forward range to "full throttle," which positions of the cam and cam follower and of the lever 10 are shown in dotted lines in Figs. 1 and 2.

Mounted in the cam box 30 are shown three electrical switches S₁, S₂ and S₃, adapted to be operated by the cams C₁, C₂ and C₃, fixed on shaft 23, which close electrical circuits to any desired type of signal such as the lights L₁, L₂ and L₃ on the engine room indicator, designated generally by 40. These lights may be mounted on the panel of the indicator as shown or may be adapted to illuminate translucent panels of an indicator. Horns or bells may be substituted for the lights or used in conjunction therewith.

A flexible shaft 41 which is driven by the cam shaft 23 rotates a pointer 42 about the face of the indicator 40 on which the indicia are so placed as to correspond with the positions of the lever 10. Thus the indicator may be used to advise the engine room crew as to the control put into effect by the pilot and also to give directions, as for example to shift gears if the same are not under the pilot's direct control.

Referring to Fig. 3, the control mechanism is shown in association with an internal combustion engine 50 having a gear box 51, drive shaft 52, distributor 53 and carburetor 54. The cam box 30 is mounted adjacent the engine and connected to the engine controls by suitable linkage. The throttle controlling cam 25 actuates the throttle of carburetor 54 through the rod 55. A cam 56, through the linkage 57, 58, 59 functions to advance and retard the ignition in the desired relationship to the engine speed as determined by the throttle opening, regulated by cam 25. A cam 60 acts through rod 61 on the lever 62 of a gear shifting control unit 63 so that the gears are properly positioned in the "ahead," "neutral" or "astern" positions as the lever 10 is moved to those positions. The cams C₁, C₂ and C₃ operate

as described above in the electrical circuit which is shown diagrammatically.

When the boat is cruising at relatively slow speeds it is economical to use a lower grade of fuel than is desirable to develop the maximum power from the engine at high speeds. Thus it is desirable to have two fuel supplies available which can be fed to the engine according to the conditions of its operation. In Fig. 3 there are shown two fuel lines 70 and 71 leading from tanks (not shown), one for fuel of higher octane number than the other. Both lines feed into a change-over valve 72 which operates to connect one line or the other to the carburetor 54 through pipe 73. Valve 72 is actuated by rod 75 which is moved by the valve control cam 76 fixed on shaft 23, the cam being so shaped as to actuate the valve to change over the fuel at a predetermined point in the opening of the throttle, for example, at the point where lever 10 passes the shoulder 16 (Fig. 2).

It may be seen from Fig. 3 that by the movement of a single lever 10 the pilot has complete control over the engine 50 through the cam shaft 23 and the cams thereon and that simultaneously with his operation of the control the signals are operated showing the setting of the controls. The pilot may thus have complete and direct control over the manoeuvring of his boat without having to attend to more than two controls, one for steering and one for the engine.

It is to be understood that the invention is not to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

What is claimed is:

In a high-speed power boat having an engine provided with a speed-controlling throttle and a reversible drive assembly which affords "ahead" and "astern" propulsion for said boat, said engine being remote from the bridge, control means for affording the pilot direct control of the engine throttle comprising, a pilot's control box having a shoulder, a throttle-control lever pivoted for rotation thereabout and movable through a high speed "ahead" range on one side of said shoulder and through slow speed "ahead" and "astern" ranges on the other side thereof, a manually operable detent normally preventing passage of said lever past said shoulder by engagement therewith while permitting free movement on either side thereof, driving gear operated by said lever, a cam shaft adjacent the engine rotated by said gear, a throttle-control cam fixed on said shaft, a cam-follower resiliently held against said cam but capable of being withheld from contact therewith, means for operatively connecting the cam-follower with said throttle whereby movement of the cam-follower toward the cam-shaft opens the throttle, and manually adjustable means for limiting the throttle-opening movement of the cam-follower independently of the position of the cam whereby maximum engine speed can be controlled independently of the pilot, the said cam being so shaped and positioned as to close the throttle when said lever is between the "ahead" and "astern" ranges and open it by a limited amount through the "astern" range and progressively open it to full throttle through the "ahead" range.

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