Sept. 16, 1958 J. G. INGRES 2,851,899

MOTORBOAT ENGINE CONTROL MEANS

Filed Jan. 13, 1953 2 Sheets-Sheet 1

Fig. 1

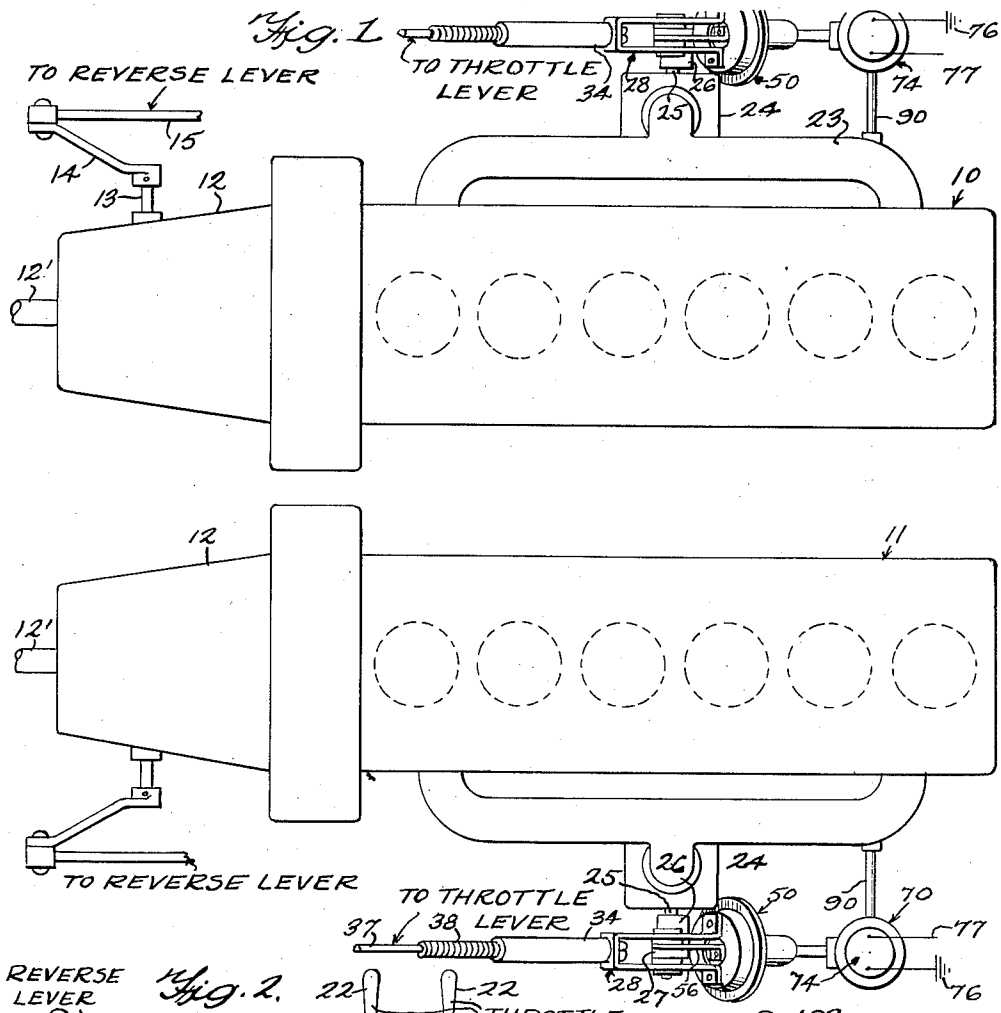
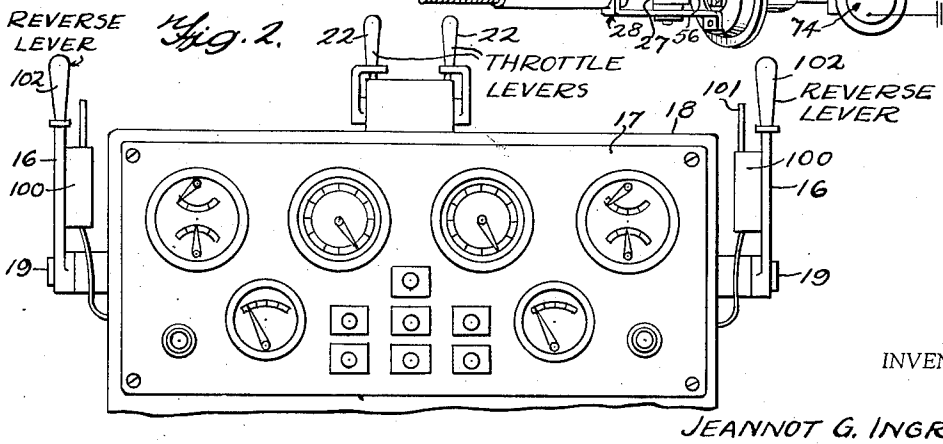


Fig. 2.



INVENTOR

JEANNOT G. INGRES

BY John Y. Phillips

ATTORNEY

Sept. 16, 1958 J. G. INGRES 2,851,899

MOTORBOAT ENGINE CONTROL MEANS

Filed Jan. 13, 1953 2 Sheets-Sheet 2

Fig. 3.

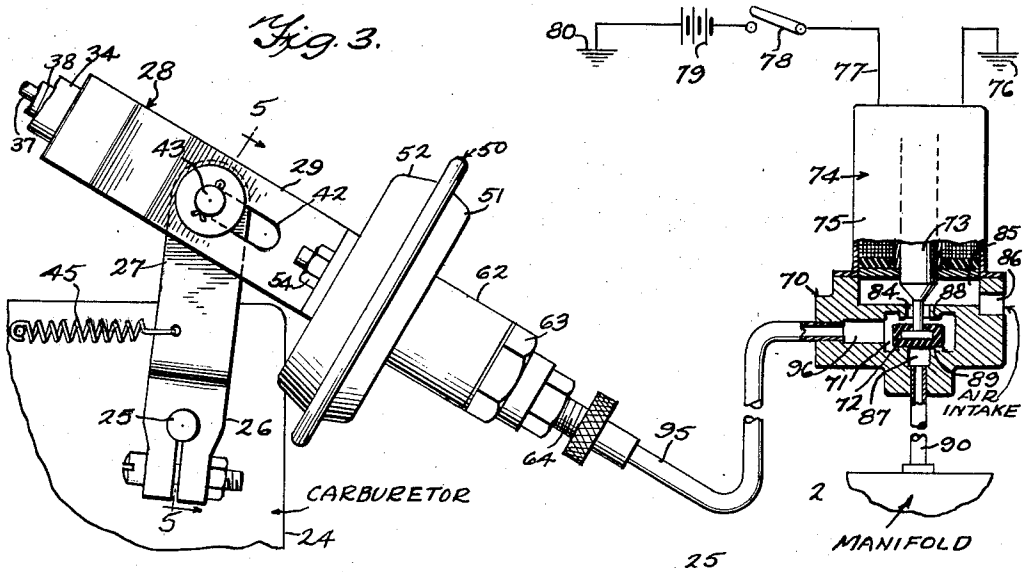


Fig. 4.

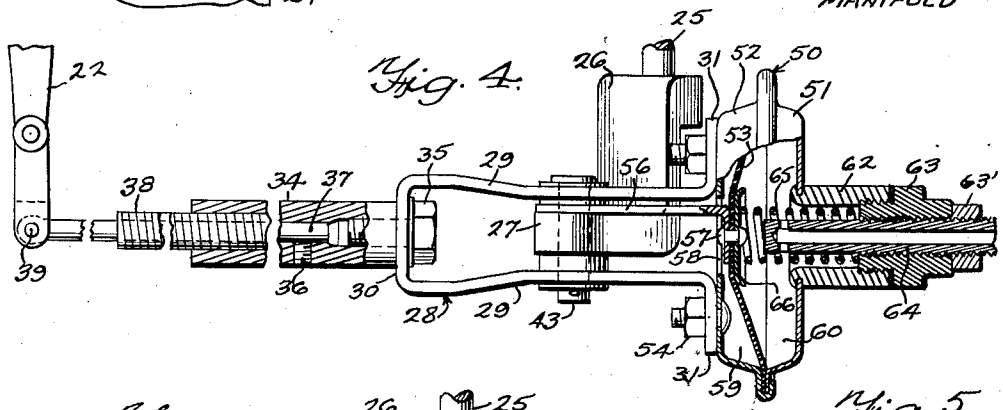


Fig. 6.

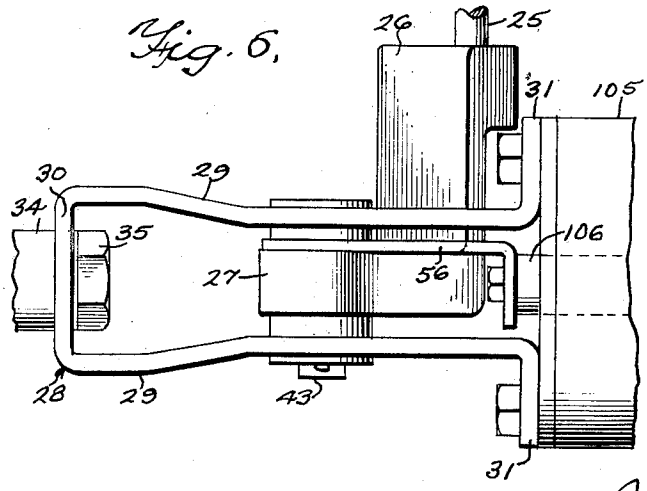
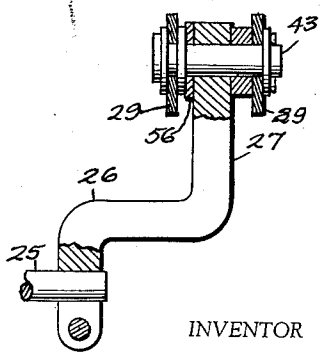


Fig. 5.



INVENTOR

JEANNOT G. INGRES

BY John V. Phillips

ATTORNEY

United States Patent Office

2,851,899

Patented Sept. 16, 1958

2,851,899

MOTORBOAT ENGINE CONTROL MEANS

Jeannot G. Ingres, Dearborn, Mich., assignor to Automatic Shifters, Inc., Richmond, Va., a corporation of Virginia

Application January 13, 1953, Serial No. 331,008

7 Claims. (Cl. 74—472)

This invention relates to motorboat engine control means, and more particularly to the controlling of the throttles of twin motorboat engines during the operation of the reverse levers thereof.

Twin screw motorboats, cruisers, and the like are provided with one engine for each propeller, and each engine is provided with its own reverse gear. Of course, each engine is a complete power plant in itself, being provided with the usual carburetor and the throttle levers therefor conventionally arranged adjacent an instrument panel. When both propeller screws are driving the boat forwardly, the two reverse levers are left in forward position, and the operator's hands are free to control the throttle levers of the two engines, the speed of the engines usually being synchronized by operation of the throttle levers in accordance with tachometer operations as viewed on the instrument panel.

When a motor boat of this type is being turned under conditions in which it is not sufficiently responsive to rudder control, for example when backing out of a dock and turning outwardly therefrom, the operator usually maneuvers the boat by operation of the regular reverse levers, one of the levers being placed in reverse position to cooperate with the forwardly turning other propeller to provide for a sharp turning of the boat. The maneuvering of the two reverse levers requires the use of both hands of the operator, and when so maneuvering the boat, it is the common practice arbitrarily to set the throttle levers at a given relatively low speed position and the throttle levers cannot be controlled by the operator while he is maneuvering the reverse levers.

An important object of the present invention is to provide a novel type of throttle control mechanism for a motorboat engine, wherein the throttle of the engine may be opened in conjunction with the operation of a reverse lever by manipulation of a manual control handle arranged in close proximity to the reverse lever.

A further object is to provide novel control means for the throttles of the respective motors of a twin screw boat having reverse gears operable by reverse levers, wherein the throttle control means for each motor is arranged in close proximity to and operable simultaneously with the associated reverse gear, to permit the operator to accelerate the speed of operation of either or both motors without releasing his hands from the reverse gears.

A further object is to provide such a mechanism wherein the throttle of either motor may be opened to accelerate the associated motor regardless of the positions of the associated conventional throttle control levers.

A further object is to provide such a mechanism having conventional throttle control levers for the respective motors connected by motion transmitting mechanisms to control the throttles, and to provide in each motion transmitting mechanism a device operable independently of the throttle control lever for accelerating the speed of either engine.

A further object is to provide such a mechanism wherein the devices for controlling the engine throttles independently of the throttle levers each comprises a control handle adjacent one of the reverse levers and operable by hand of the operator grasping such lever while maintaining it in any desired position.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings I have shown two embodiments of the invention. In this showing:

Figure 1 is a plan view of a motorboat twin screw power plant showing the two engines and associated elements;

Figure 2 is a face view of a conventional control panel for such power plant showing the auxiliary control devices associated therewith;

Figure 3 is an enlarged fragmentary side elevation of the means for transmitting motion to the throttle of one of the engines and associated elements, an electrical diagram for a solenoid control valve being shown;

Figure 4 is a plan view of the same, omitting the control valve means, parts being shown in section;

Figure 5 is a detail sectional view on line 5—5 of Figure 3, parts being shown in elevation, and indicating the connection of one of the throttle levers to the means for operating such lever; and

Figure 6 is a view generally similar to Figure 4, showing a modified type of means operable as an auxiliary device for moving one of the engine throttles.

Referring to Figure 1, the numerals 10 and 11 indicate as a whole a pair of motorboat engines for respectively driving the twin screws of a boat. Each engine, through a reverse gear 12, drives a conventional propeller shaft 12'. Each reverse gear has the usual rock shaft 13 to which is connected a crank 14 movable back and forth in the usual manner between forward and reverse gear positions. To operate the cranks, motion transmitting means 15 is shown as being connected to each crank, and this motion transmitting means is operable through the medium of the usual reverse lever 16 (Figure 2).

Each reverse lever is preferably arranged at one end of a control panel 17 of any desired type having the usual voltmeter, ammeter, tachometer, etc. for each of the engines. The control panel is carried by a conventional housing 18, and into this housing project rock shafts 19 carrying the respective reverse levers 16 and to which the motion transmitting means 15 for the reverse gear cranks are connected in a conventional manner. The housing 18 has associated therewith a pair of throttle levers 22, shown in the present instance as being supported above the housing 18, and the throttle levers are operable as described for controlling the respective carburetors 24 (Figure 1) of the engines 10, these carburetors supplying explosive mixtures through the conventional manifolds 23 to the cylinders of the engines 10 and 11.

Each carburetor 24 is provided with a conventional throttle valve (not shown) mounted on a throttle shaft 25 to which is connected the lower end of a lever 26 the upper end 27 of which is offset, as shown in Figure 5, away from the carburetor 24. The upper end 27 of each lever 26 extends into a yoke indicated as a whole by the numeral 28 and having arms 29 connected by a head 30 at one end, the other ends of the arms 29 being turned outwardly to form attaching feet 31 for a purpose to be described.

A rigid tube 34 is connected to the yoke head 30, as at 35, and has one end thereof rigidly connected, as at 36, to an operating shaft 37. This shaft may be flexible and operable in a flexible housing 38, and the other end

of each shaft **37** is connected, as at **39**, to one of the throttle levers **22**. Movement of either throttle lever, through its shaft **37** and yoke **28**, imparts movement to one of the throttle operating levers **26**, as further described below.

As shown in Figure 3, each yoke arm **29** is slotted longitudinally as at **42**, and a pin **43** extends through these slots. The pin **43** is pivotally connected to the upper end of the associated lever arm **27** and, as will become apparent below, the pin **43** of each throttle operating unit is normally arranged in the upper ends of the slots **42**, which position is shown in Figure 3. Each pin **43** is biased to such position by a return spring **45**, connected to the associated lever arm **27** to bias the corresponding throttle to idling position. It will be obvious that any movement of the flexible shaft 37 to the right in Figures 3 and 4 will move the pin **43** in the same direction to rock the shaft **25** clockwise to open the associated throttle.

It further will be apparent that the pin **43** of each throttle operating unit is movable downwardly and to the right in Figure 3, independently of the yoke **28**, to similarly rock the associated throttle shaft **25**, and means are provided for effecting such movement of the pin **43**. Referring to Figures 3 and 4, the numeral **50** indicates as a whole a small fluid pressure motor comprising casing sections **51** and **52** having a flexible diaphragm **53** clamped therebetween, as clearly shown at the bottom of Figure 4. The attaching feet **31** of the yoke **28** are secured as at **54** to the casing section **52**.

An operating arm **56** is associated with each throttle operating unit and has its body portion extending into the associated yoke **28** and pivotally connected at its upper end to the pin **43**, as shown in Figure 4. The right-hand end of the member **56** is bent laterally and riveted or otherwise connected, as at **57**, to the diaphragm **53**, the member **56** projecting through an opening **58** extending axially through the casing section **52**.

The diaphragm **53** divides the motor into a pair of chambers **59** and **60**, the former of which is in fixed communication with the atmosphere through the opening **58**. The casing section **51** carries a sleeve **62** fixed thereto axially thereof, and a union **63**, carried by the sleeve **62**, connects thereto a pipe **64** opening into the chamber **60**. A spring **65** projects into the sleeve **62** and has one end engaging the union **63** and its opposite end engaging a spring seat **66** connected to the diaphragm **53** by the rivet **57**. The spring **65** obviously tends to hold the diaphragm **53** in the normal position shown in Figure 4. The pipe **64** is threaded in the union **63** and is held in adjusted positions by a lock nut **63'**.

Referring to Figure 3, numeral **70** designates a valve housing having a central pocket **71** in which is arranged a resilient valve **72** carried by the lower end of a stem forming part of the armature **73** of a solenoid **74**. This solenoid includes a coil **75** one terminal of which is grounded as at **76**. The other terminal of the solenoid is connected by a wire **77** to a switch diagrammatically indicated at **78** and further referred to below as to its association with other parts of the mechanism. The switch **78** is connected to one terminal of a source **79** the other terminal of which is grounded as at **80**.

The pocket **71** communicates through a port **84** with a chamber **85** in fixed communication with the atmosphere through a port **86**. The pocket **71** is also adapted to communicate with a port **87**, and the ports **84** and **87** are provided at their adjacent ends respectively with valve seats **88** and **89**. The port **87** is connected by a pipe **90** with the associated intake manifold **23** (Figures 1 and 3).

The pipe **64** which communicates with the motor chamber **60**, as stated, is connected at its outer end to a flexible pipe **95** leading, as diagrammatically shown in Figure 3, to a port or passage **96** communicating with the pocket or chamber **71**. When the valve **72** is in the normal position shown in Figure 3, the motor chamber **60** will communicate with the atmosphere through the pipe **95**, port **96**, chamber **71**, port **84**, chamber **85**, and port **86**. When the solenoid **74** is energized, the valve **72** moves upwardly to close the atmospheric port **84** and open the vacuum port **87**, whereupon the motor chamber **60** will be connected with the intake manifold of its associated engine to energize the motor **50**, pull downwardly on the connecting member **56**, and thus open the associated engine throttle, as further described below.

Figures 3 and 4 illustrate the operating means associated with the throttle control mechanism for each motor. Each switch **78** is mounted in a housing **100** (Figure 2) carried by the associated reverse lever **16**, and each switch is provided with an operating finger **101** adjacent the handle **102** of the associated reverse lever. Thus, while grasping either handle **102**, the operating finger **101** of the associated switch may be moved to energize the associated solenoid **74**.

The means described for effecting movement of each pin **43** independently of the associated throttle lever **22** is highly effective, and very little current is required for the operation of the solenoids **74**. In place of the vacuum motor **50** for each throttle control mechanism, a solenoid **105** (Figure 6) may be employed, such solenoid having an armature **106** connected to the associated connecting member **56**. The circuit for each solenoid **105** will be the same as in Figure 3, and upon a closing movement of either switch **78**, one solenoid **105** will be energized to move the connecting member **56** in the same manner that this is done by the vacuum motor in the form of the invention shown above. The solenoid **105** is not preferred since it must be substantially heavier than the solenoids **74** and will constitute a greater drain on the battery or batteries of the boat.

Operation

It will be apparent that the throttle levers **22** are arranged in close proximity to each other to facilitate their simultaneous operation; and in the straight-away driving of the boat, these levers will be arranged in a position to drive both motors at the same speed as indicated by the engine tachometers on the instrument panel. As indicated in Figure 4, the throttle levers referred to are connected to the flexible shaft **37** or other motion transmitting means to transmit movement to either or both yokes **28** to operate the lever **27** and turn the throttle shaft **25**. The fluid pressure motor of each throttle control unit is fixed to the yoke **28** of such unit and moves bodily therewith, this movement being permitted by the flexible pipe connection **95** in each case. It will be apparent that the biasing spring **45** (Figure 3) of each throttle unit keeps the pin **43** in the upper end of the slot **42** to tend to maintain the throttle levers in idling position. These levers are provided with the conventional friction or detent means for holding them in any position in which they are placed. Any movement of the throttle levers to open the throttles moves the yokes **28** and pins **43** downwardly as viewed in Figure 3, and upon movement of the throttle levers in the opposite direction, the return springs **45** cause the pins **43** to follow such movement. The engine throttles are thus controllable by the throttle levers independently of the fluid pressure motor **50**.

Assuming that the boat is to be maneuvered to turn it, such operation is facilitated by the controlling of the twin engines in accordance with conventional practice. It is one of the advantages of a twin screw boat that steering in close quarters at low speeds can be readily practiced by placing one motor in forward gear and the other in reverse. The present invention is intended greatly to facilitate such maneuvering.

It is the common practice under the conditions referred to, to set the throttle levers for somewhat above idling engine speeds and then to control the motors by

grasping the handles **102** of the reverse gear levers. Manipulating these levers requires both hands, and the operator cannot control engine speeds in conventional mechanism while manipulating the reverse levers. As stated, the throttles are opened beyond idling speeds, but conventionally are not opened to a substantial extent, since the speeding up of the engines puts a great strain on the reverse gears as the latter are moved back and forth between their forward or reverse and neutral positions.

In the present apparatus both throttles may be left in idling position, or in slightly above idling position, and both throttles may be operated with easy facility without the operator's having to release his hands from the reverse levers. For example, with the engines both idling, the operator may push forwardly on the left-hand reverse lever in Figure 2 and pull rearwardly on the other reverse lever. Then, without touching the throttle levers, the operator may speed up either or both of the engines merely by operating one or both of the switch fingers **101**. This operation may be performed without releasing either hand from the reverse lever, merely by hooking one finger around each switch finger **101**. The switches **78** (Figure 3) may be of any desired type and will be biased to open position to be moved to closed position upon operation of the corresponding switch finger **101**.

Assuming that the engine whose throttle control mechanism is illustrated in Figures 3 and 4 is to be accelerated, the closing of the switch **78** will energize the solenoid **74**, thus moving the valve **72** from the normal position shown in Figure 3, to the other position, closing the air port **84**, and opening the vacuum port **87**. The motor chamber **60** (Figure 4) then will be connected to the intake manifold and the diaphragm **53** will be moved to the right and motion will be transmitted through the arm **56** to the pin **43** to pull downwardly and to the right on the lever **27** (Figure 3), and this operation takes place independently of the throttle lever without changing the position thereof. The movement of the lever **27** under such conditions will be limited by the length of the slot **42** or by the throw of the diaphragm **53** in accordance with the adjustment of the pipe **64**, whichever distance is smaller.

As stated, the power movement of the lever **27** takes place independently of the associated throttle lever, and this is true with respect to any given setting of the lever. However, the throttle of either engine may be opened wider to the same extent, regardless of the setting of either throttle lever, since the beginning of the power movement of the pin **43** will take place from the position of the pin **43** predetermined in accordance with the setting of the associated throttle lever.

When the maneuvering of the boat has been completed, or it is desired for any other reason to return either throttle to a setting corresponding to the setting of its throttle lever, the switch finger **101** merely will be released to de-energize the solenoid **74**, whereupon the valve **72** will drop to its normal position to open the motor chamber **60** to the atmosphere. The spring **65** will then return the diaphragm **53**, yoke **28**, arm **56**, and pin **43** to their previous position, with the pin **43** in the upper end of the slot **42**, wherever such end of the slot will have been positioned in accordance with the manual setting of the corresponding throttle lever.

In the form of the invention shown in Figure 6, the operations are carried out in exactly the same manner, the only difference being that the power means for operating the arm **56** will be the solenoid **105**, movement of the armature **106** of which will pull the arm **56** to advance the throttle of either engine. The structure in Figure 5 is substantially simpler, but its use is not recommended where substantial maneuvering of the boat customarily takes place, since the current drain on the battery is greater where a solenoid is depended upon to move the throttle than is true as in Figure 3, where a solenoid is depended upon merely to move a light valve.

With either form of the invention, a switch finger is arranged adjacent the reverse lever and movable to energize a power means for advancing the throttle of an engine regardless of the setting of the throttle lever. In either case, the throttle lever will remain in its manually adjusted position, and the present device will function to advance the throttle a predetermined angular turning movement, regardless of the position from which such operation starts, the starting position being determined in accordance with the setting of the manually operable throttle levers. The invention greatly facilitates the handling and controlling of the engines of the boat, and particularly with respect to twin screw boats wherein the propellers are driven from separate engines, which it is highly desirable to control in the operation of the two screws for maneuvering the boat.

I claim:

1. A throttle control mechanism for internal combustion engines comprising a throttle controlling member having a normal throttle idling position and movable in a given direction from such position to accelerate the engine, means biasing said member towards such normal position, a manually operable throttle control lever, motion transmitting connections between said lever and said member, said motion transmitting connections comprising an element movable by said lever and provided with a slot, and a pin carried by said member and operable in said slot, said biasing means urging said pin to one end of said slot to be normally movable by said element upon movement of said lever, and means carried by said motion transmitting connections for transmitting movement to said pin independently of said element to move said member in said direction.

2. A mechanism constructed in accordance with claim 1 wherein the means for moving said pin comprises a power device having mechanical connection with said pin, and manually operable means for controlling energization of said power device.

3. A mechanism constructed in accordance with claim 1 wherein the means for moving said pin comprises a differential fluid pressure operated motor having a pressure movable member connected to said pin, and a manually controllable valve mechanism for energizing said motor.

4. A mechanism constructed in accordance with claim 1 wherein the means for moving said pin comprises a differential fluid pressure operated motor having a pressure movable member connected to said pin, said motor having pressure chambers on opposite sides of said pressure movable member, one chamber being a constant pressure chamber and the other being a variable pressure chamber, a valve biased to a position connecting said other chamber to the atmosphere and movable to an operative position to disconnect said other chamber from the atmosphere and connect it to a source of pressure differential, and a solenoid connected to said valve and energizable to move it to said operative position.

5. The mechanism constructed in accordance with claim 1 wherein the means for moving said pin comprises a solenoid having an armature mechanically connected to said pin, and means comprising a switch for energizing said solenoid.

6. A control mechanism for an internal combustion engine having a throttle controlling member, a reverse gear, and means comprising a lever for shifting said reverse gear, a manually operable throttle lever remote from said reverse gear lever, motion transmitting connections between said throttle lever and said member, means biasing said member toward a normal throttle idling position, a fluid pressure operated motor carried by said motion transmitting connections between said throttle lever and said member and having a pressure movable element mechanically connected to said mem-

ber, a valve mechanism for controlling said motor, said valve mechanism comprising a valve movable between a normal position balancing pressures in said motor and an operative position establishing pressure differentials in said motor, a solenoid energizable for moving said valve to said operative position, a manually operable element arranged in proximity to said reverse gear lever and operably simultaneously therewith, and means for energizing said solenoid comprising a switch operable by said manually operable element.

7. A control mechanism for an internal combustion engine having a throttle controlling member, a reverse gear, and means comprising a lever for shifting said reverse gear, a manually operable throttle lever remote from said reverse gear lever, motion transmitting connections between said throttle lever and said member, means biasing said member toward a normal throttle idling position, a solenoid carried by said motion transmitting

connections having an armature between said throttle lever and said member and mechanically connected to said member, a manually operable element arranged in proximity to said reverse gear lever and operable simultaneously therewith, and a circuit for said solenoid comprising a switch operable by said manually operable element.

References Cited in the file of this patent

UNITED STATES PATENTS

1,508,418	Stewart	Sept. 16, 1924
1,553,319	Lardner	Sept. 15, 1925
1,815,772	Gray	July 21, 1931
1,925,000	Mullins	Aug. 29, 1933
2,106,607	Kelley	Jan. 25, 1938
2,593,170	Morse	Apr. 15, 1952
2,617,311	Miller	Nov. 11, 1952
2,618,235	Clark	Nov. 18, 1952