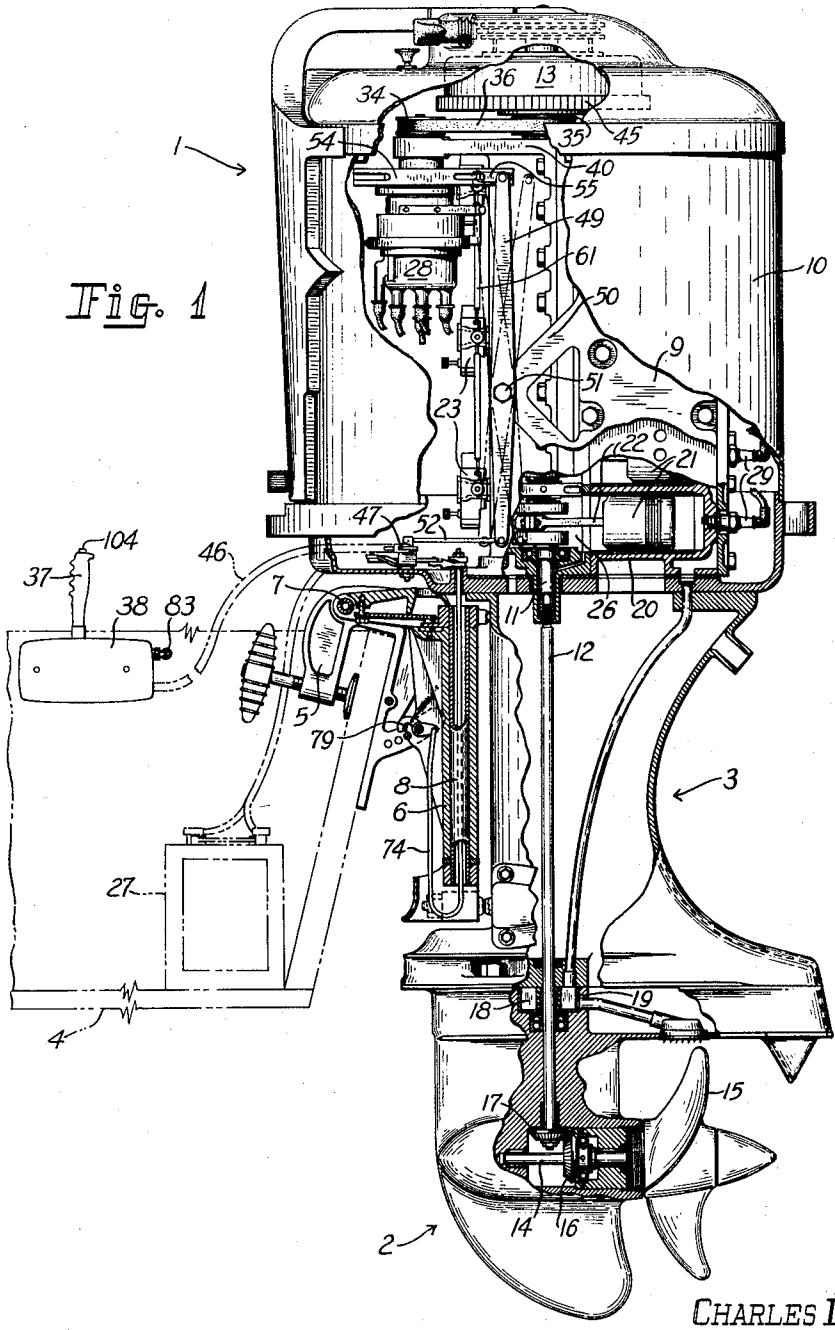
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REVERSIBLE OUTBOARD MOTOR

Filed April 22, 1957 4 Sheets-Sheet 1

Fig. 1



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REVERSIBLE OUTBOARD MOTOR

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Fig. 2

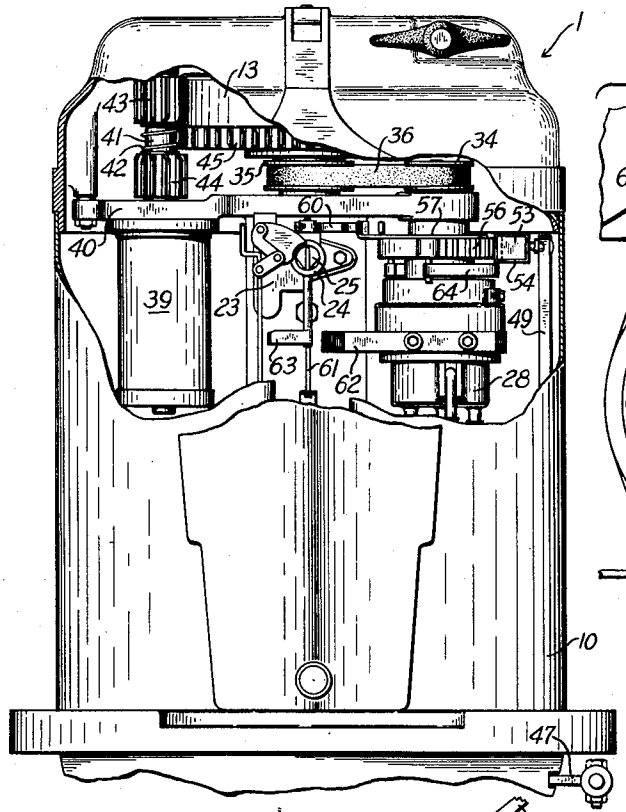


Fig. 5

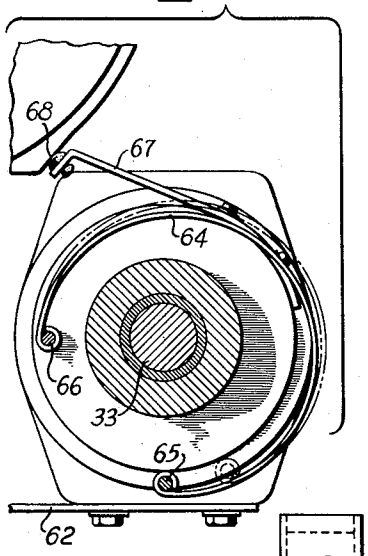


Fig. 4

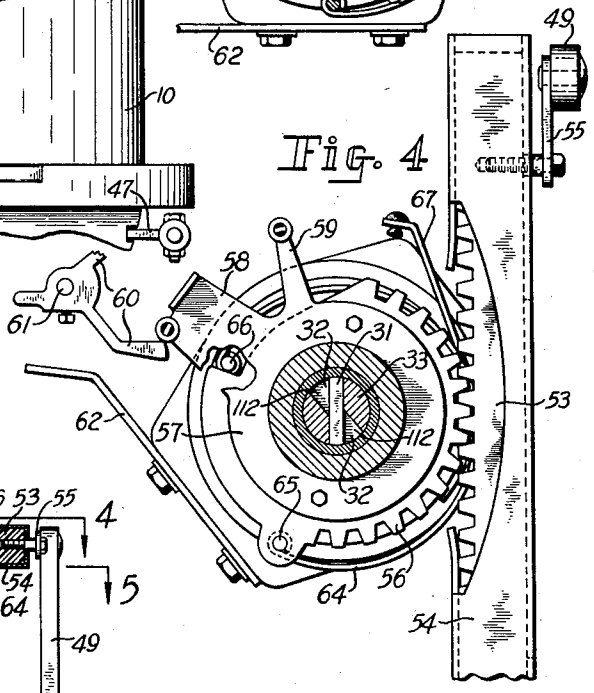
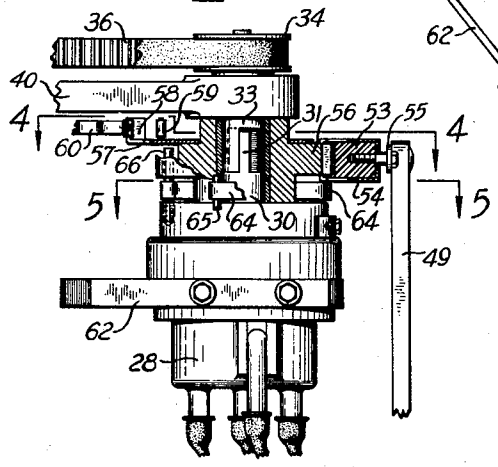


Fig. 3



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REVERSIBLE OUTBOARD MOTOR

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Fig. 6

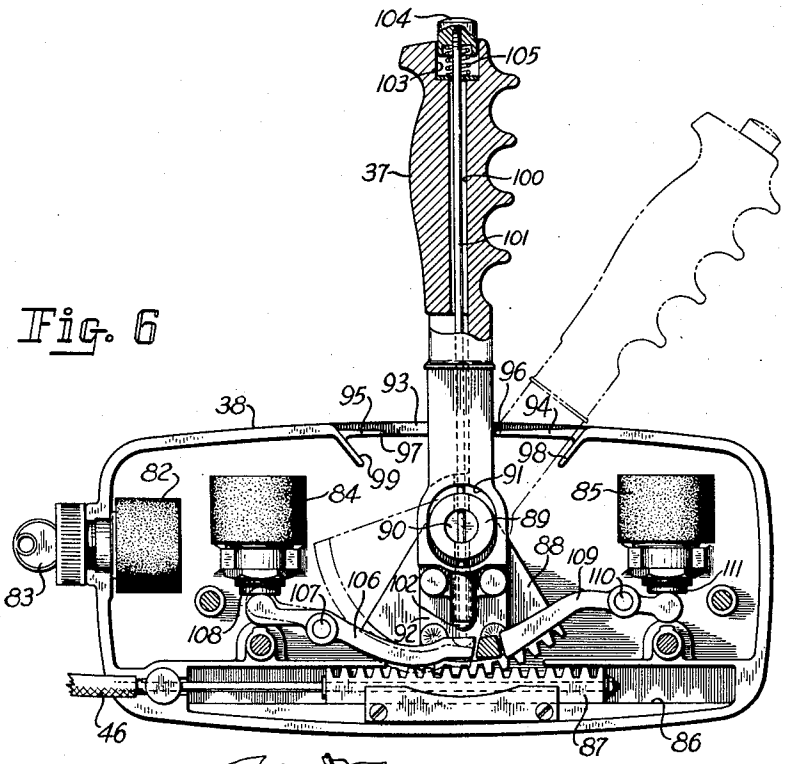


Fig. 8

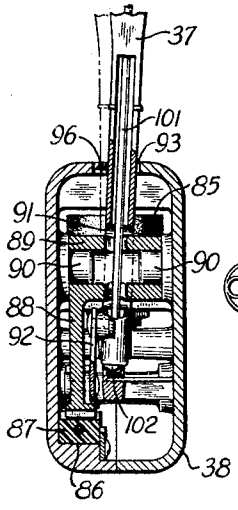
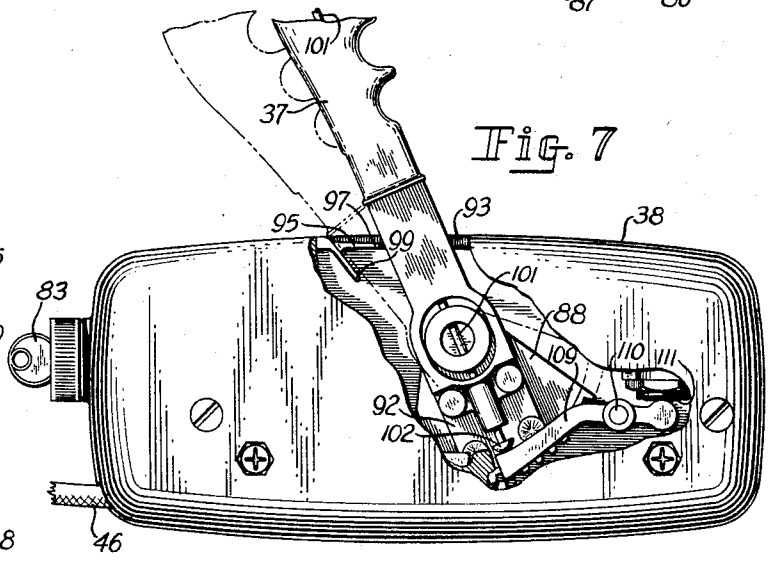


Fig. 7



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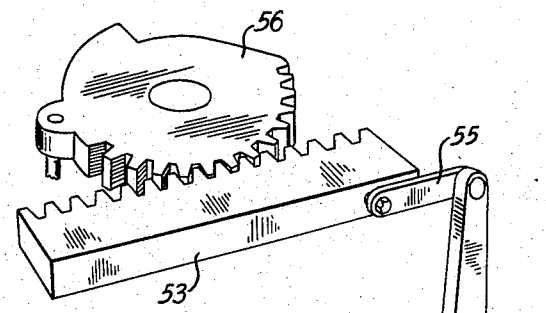


Fig. 9

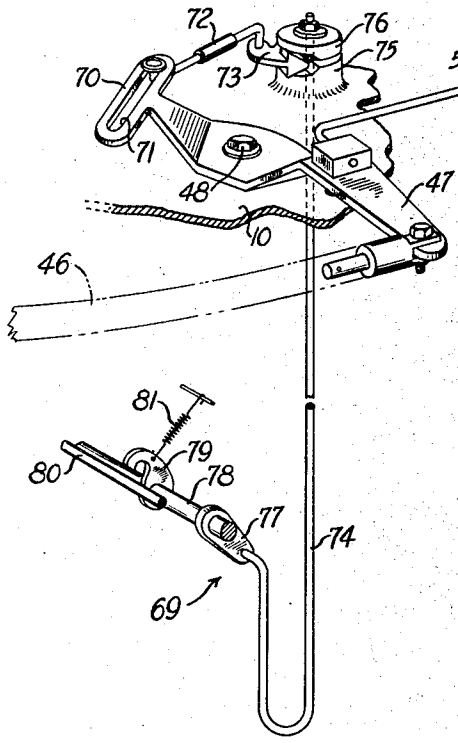
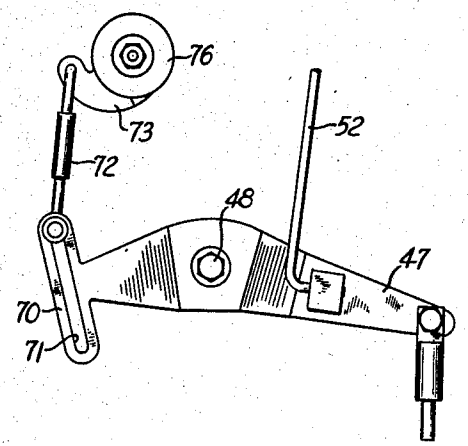


Fig. 10



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United States Patent Office 2,909,146 Patented Oct. 20, 1959

2,909,146

REVERSIBLE OUTBOARD MOTOR

Charles D. Strang, Oshkosh, Wis., assignor to Kiekhaefer Corporation, Cedarburg, Wis., a corporation of Wisconsin

Application April 22, 1957, Serial No. 654,141

12 Claims. (Cl. 115—17)

This invention relates to a reversible outboard motor wherein reversal is obtained by reversing the engine constituting the power source for the drive.

It has been proposed heretofore to reverse an outboard motor by turing the same 180° on its steering axis. This proposal has a number of objections including the fact that the steering course of the boat is not maintained during the reversal.

Several outboard motors on the market employ a transmission including reverse gears coupled with a clutch in the under water gear unit for the purpose of reversing the propeller. The cost of construction and maintenance involved became a problem with this type of reverse gear transmission. In addition, the lower housing of the underwater unit containing reverse gears must be relatively large for high powered outboard motors.

With the advent of electrical self-starting outboard motors in the larger horsepower capacities, the present invention provides a simple, less costly, and more advantageous system for forward and reverse drive then is obtainable with present systems.

The present invention employs a forward and reverse starter mechanism together with an interlocked mechanism for controlling the throttle, spark advance, and the tilt lock whereby the engine may be started and stopped selectively in either direction and without any substantial time delay in changing from one direction of rotation to the opposite.

In carrying out the invention, a single remote control lever operable by one hand of the operator is provided to control all of the functions with respect to starting of the engine selectively, in either direction, throttle advance and retard, spark timing advance and retard, and the tilt lock. The other hand of the operator is always available exclusively for steering.

The drawings furnished herewith illustrate the best mode of carrying out the invention as presently contemplated and set forth hereinafter.

In the drawings:

Figure 1 is a side elevation with parts broken away and showing the reversing outboard motor of this invention:

Fig. 2 is a front elevation of the power head of an outboard motor with parts broken away to show the starting mechanism, the spark timing mechanism and the throttle control mechanism of this invention:

Fig. 3 is an enlarged fragmentary view partially in section showing the spark timing and throttle control mechanisms of this invention;

Fig. 4 is an enlarged section taken on line 4—4 of Fig. 3 and additionally showing a portion of the engine;

Fig. 5 is an enlarged section taken on line 5—5 of Fig. 3;

Fig. 6 is a side elevation partially in section of the control box for the reversing outboard motor of this invention with cover removed showing the control lever in the forward starting position and with the lever further being shown in phantom in the position of full speed ahead;

Fig. 7 is a side elevation of the control box with parts broken away to show the control lever in the reverse starting position and further showing the lever in phantom in the full speed in reverse position;

Fig. 8 is a sectional view through the control box showing the control lever in position for forward operation of the motor and showing in phantom the control lever position for starting the engine;

Fig. 9 is an enlarged perspective diagrammatic representation of the tilt lock mechanism of the invention; and

Fig. 10 is a plan view of the lever means for actuating the tilt lock mechanism.

The outboard motor shown in the drawings comprises in general the power head 1, the underwater unit 2 and the intermediate drive shaft housing 3. The outboard motor is supported on the transom of a boat 4 by means of a clamp bracket 5 and swivel bracket 6 which are pivotally assembled on the transverse horizontal pin 7 to provide for tilting of the motor on a horizontal axis. The motor is dirigibly mounted to the bracket 6 by means of the hollow pintle 8 to provide a vertical steering axis for the motor.

The power head 1 includes the usual internal combustion engine 9 enclosed within a cowl 10. The engine 9 is disposed with the crankshaft 11 vertical and generally in line and coupled to the vertical drive shaft 12 of unit 3. The crankshaft 11 carries the flywheel 13 at the upper end thereof.

The underwater unit 2 contains the usual horizontally disposed propeller shaft 14 carrying on the rear end thereof a propeller 15. The drive shaft 12 has a bevel gear 16 at its lower end within unit 2 and meshing directly with a drive gear 17 on the propeller shaft 14 to drive the propeller 15 in either direction depending upon the direction of rotation of crankshaft 11. The drive shaft 12 also carries a reversible pump impeller 18 within the pump chamber 19 to supply coolant water to the cooling system, not shown, of the engine regardless of the direction of rotation of the propeller shaft.

Reversal of the propeller 15 is obtained by reversing the rotational direction of the crankshaft 11. For this purpose, the engine 9 is reversed in operation.

The engine 9 is a reciprocating internal combustion engine having the usual cylinders 20, each having a piston 21, and connecting rod 22 between the piston and crankshaft 11. A carburetor 23 supplies a suitable fuel mixture through an intake passage 24 to the engine. The throttle valve 25 is disposed in passage 24 to control the supply of fuel to the engine. The engine illustrated is of the two-cycle type wherein the fuel flows through the passage 24 to the crankcase 26 which encloses the crankshaft 11. Suitable transfer ports, not shown, supply the fuel from the crankcase 26 to the cylinders 20.

The ignition for the engine is supplied by means of the battery 27 through a suitable distributor 28 to the spark plugs 29 for the respective cylinders 20. The distributor shaft 30 carrying the distributor cam and rotor, not shown, is provided with a tongue 31 at the upper end thereof for engaging groove 32 at the lower end of the shaft extension 33. Shaft 33 carries gear 34 at the upper end thereof in horizontal alignment with gear 35 carried by the crankshaft 11. A flexible toothed belt 36 extends around gears 34 and 35 in driving relation and assures that the distributor shaft 30 is driven in timed relation with the engine 9.

According to this invention, a single control lever 37 operably disposed within a control box 38 provided remotely from the outboard motor controls all of the functions with respect to starting the engine, throttle advance and retard spark timing advance and retard, and the tilt lock.

The starting system for engine 9 comprises an electrical

starting motor 39 powered by battery 27 and which is secured relative to the engine by suitable means such as a bracket 40 so that the motor shaft 41 extends adjacent to the engine flywheel 13 and rotates on an axis parallel to that of the flywheel. The portion of shaft 41 adjacent to the flywheel 13 is formed with a helix 42 and carries a pair of spaced Bendix pinion gears 43 which are selectively movable relative to the shaft on helix 42 to engage with gear 45 provided on flywheel 13 axially intermediate the pinion gears. The motor 39 is provided with a reversible field winding so that its shaft 41 is rotatable in either direction.

The throttle and spark advance for engine 9 are controlled from box 38 through a flexible cable 46 as will be explained hereinafter. As shown in Figures 1 and 9, the cable 46 is adapted to actuate lever 47 pivotally secured inside the cowl 10 at 48. The lever 47 actuates the lever 49 pivotally mounted to the engine bracket 50 at 51 through linkage member 46 to reciprocate the rack 53 slidably supported in bracket member 54 carried by the engine. The linkage member 55 between the lever 49 and rack 53 translates the arcuate lever movement to linear rack movement. The rack 53 meshes with the throttle and spark timing control gear segment 56 which is carried loosely on shaft extension 33 of distributor 28. A plate member 57 is carried by the gear segment 56 and includes projections 58 and 59 for actuating the angularly spaced throttle valve levers 60 carried by the throttle valve shaft 61 in accordance with rotation of the gear segment for forward operation. For reverse operation the projection 62 secured to the distributor 28 engages lever 63 on throttle shaft 61 to control the throttle valve 25. In the position of the gear segment 56 substantially centrally of the rack 53, as shown in Fig. 4, the throttle valve 25 is closed. From this central position counterclockwise rotation of the gear segment 56 controls the throttle valve opening in the forward direction of operation. Clockwise rotation of gear segment 56 from the position of Fig. 4 controls the throttle valve opening for reverse operation.

The gear segment 56 is also adapted to rotate the housing of distributor 28 to provide proper spark advance and retard for corresponding throttle settings to promote efficient engine operation as more fully explained in a copending application of Charles A. Alexander, Serial No. 654,209, filed April 22, 1957, and assigned to the common assignee of this invention. As shown in Fig. 5 a relatively stiff arcuate spring 64 is connected at one end to a pin 65 carried by the gear segment 56. The other end of spring 64 is connected to pin 66 carried by the housing of distributor 28. With the gear segment 56 and the housing of distributor 28 connected in this manner, clockwise rotation of the gear segment from the position shown in Fig. 4 by rack 53 to open the throttle valve 25 for reverse engine operation, also provides rotation of the distributor housing in a like direction through the spring connection to advance the spark timing in accordance with the throttle valve opening. Counterclockwise rotation of gear segment 56 from the position in Fig. 4 to open throttle valve 25 for forward engine operation provides rotation of the distributor housing in the same direction to advance the spark timing until the stop member 67 carried by the distributor engages the stop 68 provided on the engine. After engagement between the stop member 67 and stop 68, further rotation of the distributor housing is interrupted because spark advance beyond that point adversely affects the efficiency of engine 9 as the throttle is opened an additional amount. After the stop member 67 engages stop 68, further rotation of gear segment 56 to open the throttle valve 25 causes the spring 64 to expand outwardly to take up the lost motion between the gear segment and the distributor.

For reverse operation of the motor, the motor must be secured with respect to the clamp bracket so that the propeller 15 will not thread itself out of the water and pivot the motor with respect to the clamp bracket 5. A tilt lock mechanism 69 shown in Figures 1 and 9 operated by the flexible cable 46 is provided to lock the motor to the bracket 5 during reverse operation of the motor. The lock mechanism 69 is operated by lever 47 which is provided with an end portion 70 having a slot 71 opposite from the cable connected end. One end of link member 72 is disposed in the slot 71 and the other end is pivotally secured to a rotatable cam actuating member 73. The long leg of a J-member 74 extends upwardly through the hollow swivel pin 8 and into the cowl through a bore provided in cowl embossment 75 to loosely receive the cam actuating member 73 for rotation thereon. A cam 76 is secured on member 74 in sliding engagement with member 75. For reverse operation of the motor the cable 46 rotates lever 47 in a counterclockwise direction to rotate the cam actuating member 73 into engagement with the cam lifting surface of cam 76 whereby the J-member 74 is moved vertically upwardly. For forward motor operation, J-member 74 remains undisturbed upon clockwise rotation of lever 47 as the slot 71 provides for relative movement between the lever 47 and the link member 72.

The short leg of the J-member 74 extends upwardly forward of the swivel bracket 6 and is pivotally connected to a crank arm 77 mounted on shaft 78. Thus, as member 74 is raised upwardly shaft 78 is rotated in a counterclockwise direction. The shaft 78 carries one or more hook members 79, which upon rotation of the shaft engage rod member 80 carried by the clamp bracket 5 to lock the motor with respect to the clamp bracket. After the lever 47 is rotated to release the J-member 74 from its locked position, the spring 81 disposed between the hook member 79 and the swivel bracket 6 exerts a force to raise the hook member and thereby rotates the shaft 78 to return the J-member to its lowered or ineffective position.

The reversing outboard motor of this invention is remotely controlled by means of a single lever 37 operably disposed in the control box 38 as shown in Figs. 7 through 9 of the drawings. The control box 38 includes an ignition switch 82 disposed in the ignition circuit, not shown, which is closed preparatory to starting the engine 9 by means of a key 83. Box 38 further contains a forward starting switch 84 and a reverse starting switch 85 which are disposed on opposite sides of the operating lever 37. Upon closure of switch 84 the field windings of starting motor 39 are energized so that the motor will crank the engine 9 to provide for forward operation of the outboard motor. Closure of switch 85 energizes the field windings of starter motor 39 in the opposite direction so that engine 9 is cranked to provide for reverse operation of the outboard motor. The means for closing switches 84 and 85 will be explained hereinafter.

The control box 38 includes a slide 86 formed in the low portion thereof for reciprocably receiving a rack 87. The flexible cable 46 is connected to the rack 87 and is actuated in accordance with rack reciprocation to control the outboard motor. The rack 87 in turn is actuated by the gear segment 88 having a hollow shaft portion 89 which is journalled on aligned shaft portions 90 provided on the opposed sides of box 38. The control lever 37 extends into the box 38 and is provided with an opening 91 adjacent the lower end thereof for receiving the shaft portion 89 of gear segment 88 in spaced relation. Beneath opening 91 the lever 37 is secured to the gear segment 88 by means of a stiff spring plate 92 to provide for lateral movement of the lever about the plate 92 relative to the gear segment as shown in Fig. 8.

The upper portion of the control box 38 is provided with an elongated opening 93 through which the control

lever 37 extends. A pair of longitudinally spaced lateral projections 94 and 95 are formed on box 38 and extend into the opening 93 to provide stops 96 and 97, respectively, whereby the lever 37 may be readily indexed in the forward starting position and the reverse starting position. According to Fig. 6 lever 37 abuts against stop 96 and is thereby indexed for starting engine 9 to provide for forward operation of the motor. In Fig. 7 the lever 37 is shown engaged with stop 97 for indexing in accordance with reverse starting. In the starting lever positions shown in Figs. 6 and 7, the control apparatus actuated by cable 46 have set the engine 9 for idling in their respective directions of operation. To propel the boat 4 to which the outboard motor is secured in the forward direction, the lever 37 is moved laterally pivoting about the spring plate 92 until the lever has cleared the edge of stop 96 as shown in Fig. 8. The lever 37 may then be actuated longitudinally of opening 93 along the edge of projection 94 between the lever positions shown in Fig. 6, to actuate the rack 87 and cable 46 to thereby control the engine 9 through its range of speed. The phantom lever in Fig. 6 shows the position of maximum speed in a forward direction as the lever engages the stop 98 formed on box 38. To propel the boat 4 in the reverse direction, lever 37 is moved laterally to clear the edge of stop 97 on projection 95 and is then moved longitudinally along the edge of projection 95 to control the engine 9 through its reverse range of speed. The phantom lever position in Fig. 7 shows the full speed in reverse position with the lever abutting against stop 99 formed on control box 38.

The control lever 37 also carries mechanism whereby the starting switches 84 and 85 are selectively actuated in accordance with the desired direction of operation. A cylindrical bore 100 extends through the full length of lever 37 and carries a reciprocable rod 101 therein. The lower end of rod 101 extends beyond bore 100 and is provided with a blunt end portion 102 having a diameter somewhat larger than bore 100. The bore 100 is enlarged at the upper end of the lever 37 to provide the cylindrical recess 103. A cap member 104 corresponding in diameter substantially to that of recess 103 is threaded on the end of the rod 101 and is received within the recess with the upper portion of the cap member extending upwardoy beyond the upper end of lever 37. A spring 105 is seated in recess 103 and abuts on the lower surface of cap member 104 to maintain rod 101 in a raised position with the lower end portion 102 abutting against the lower end of the lever 37. The rod member 101 is actuated downwardly by manually depressing the cap member 104 against the pressure of spring 105 to move the end portion 102 out of engagement with the lower end of lever 37. Upon release of the cap member 104, the spring 105 returns the rod 101 to its normally raised position.

To start the engine 9 for forward operation the lever 37 is moved to its forward starting position in engagement with stop 96 on lateral projection 94. The rod 101 is then depressed to actuate its lower end portion 102 against one end of lever 106 pivotably mounted within the control box 38 at 107. The other end of lever 106 is disposed adjacent the switch button 108 of forward starting switch 84 and upon actuation of the lever 106 by end portion 102 the lever actuates switch button 108 to close the switch and thereby energize the starting motor 39 to crank the engine 9 for forward operation.

Reverse starting of engine 9 is accomplished with lever 38 disposed in engagement with stop 97 on lateral projection 95. Depression of rod 101 within lever 37 actuates one end of switch actuating lever 108 which is pivotally mounted within the control box 38 at 110. The other end of lever 109 is adapted to engage the switch button 111 of reverse starting switch 85 to close the switch and thereby energize the starting motor 39 to crank engine 9 for reverse operation.

As seen best in Fig. 6 the lever 37 must travel some distance from the forward start position to the reverse start position. In this distance of travel, cable 46 is actuated to rotate lever 47 a sufficient amount to actuate the tilt lock mechanism 69 to lock the outboard motor with respect to the clamp bracket 5 prior to starting engine 9 in reverse.

Further, this distance of travel of lever 37 from forward start position to reverse start position will actuate rack 53 to rotate the distributor housing and correspondingly affect the spark timing. Otherwise, correct spark timing for forward engine operation would be grossly out of phase for reverse engine operation.

Automatic adjustment for spark timing between forward and reverse operation is provided between distributor shaft 30 and the extension 33 thereof as best shown in Figs. 3 and 4 and is explained more fully in a copending application of Edgar Rose, Serial No. 648,643, filed Mar. 26, 1957, and assigned to the common assignee of its invention. As shown in Fig. 4 the groove 32 provided on the end of shaft extension 33 is enlarged by the removal of substantially diametrically opposed equal angular segments 112 providing angular lost motion between shaft 30 and the extension 33 thereof. The amount of angular lost motion to be provided to assure proper spark timing between forward and reverse operation of the engine 9 is calculated to compensate for the lever travel between the two starting positions and the angular difference in crank positions between the opposed directions of engine operation.

To start the engine 9 and propel the boat 4 in the forward direction, the ignition switch 82 is closed and the control lever 37 is placed in engagement with stop 96 on lateral projection 94 as shown in Fig. 6. This position of lever 37 places the throttle control and spark timing mechanism in correct position for idling operation. The switch 84 is actuated to a closed position by depressing the rod 101 in the lever 37 to start motor 39 and move the corresponding pinion gear into cranking engagement with the engine flywheel 13. After the engine 9 is started the rod 101 is released and the flywheel 13 will overrun the engaging pinion gear and move the same on its helix 42 to its out of engagement position. The control lever 37 is then pivoted laterally about spring plate 92 to clear the stop 96 and is actuated along the edge of lateral projection 94 until the motor has imparted the desired speed to boat 4. During movement of lever 37 along the edge of lateral projection 94 the flexible cable 46 effects proper throttle opening and corresponding spark timing advance. Movement of lever 37 in the opposite direction to decrease the forward speed of boat 4 effects a decrease in throttle opening and retards the spark correspondingly in response to the movement of flexible cable 46.

If the operator decides to go in a reverse direction while the boat is moving in the forward direction, he moves lever 37 in the direction to decrease his forward speed, past the forward starting position, and into engagement with stop 97 on lateral projection 95 in the reverse starting position shown in Fig. 7. Movement of lever 37 between the stops 96 and 97 operates cable 46 to rotate the distributor housing and retard the spark a sufficient amount so that it will be so completely out of phase that the engine is killed. Also as the lever 37 is moved between the stops 96 and 97 the cable 46 has rotated lever 47 a distance sufficient to operate the tilt lock mechanism 69 to lock the motor with respect to clamp bracket 5 in preparation for reverse operation of the motor. Depression of rod 101 in lever 37 will now close the reverse starting switch 85 to start motor 39 in the direction opposite from forward starting operation to place the other of the two pinions in engagement with the flywheel gear 45. As the crankshaft 11 is initially caused to rotate by the starting motor 39, the distributor extension shaft 33 driven by the gear belt

36 rotates relative to the distributor shaft 30 an amount corresponding to the lost motion therebetween to set the spark timing for efficient reverse engine operation. Thereafter engine starting for reverse operation is similar as described with respect to forward starting with the engine idling with the lever 37 abutting against stop 97 as shown in Fig. 7. Lever 37 is then actuated along the edge of lateral projection 95 for varying speeds in the reverse direction.

To return to forward operation from reverse operation, movement of lever 37 past stop 97 to abutting engagement with stop 96 again rotates the distributor housing to effect out of phase spark timing to kill the engine. After an inconsequential time delay the engine may again be started for forward operation with the distributor extension shaft 33 initially rotating to take up the lost motion between shafts 33 and 30 to reset the spark timing for efficient forward engine operation.

The invention provides a reversible outboard motor together with a control mechanism therfor which may be operated with relative ease—there being but one lever for controlling the throttle and spark advance and retard, setting the tilt lock mechanism for reverse operation and starting the engine in either direction of operation. Because only one hand of the operator is needed to control the operation of the engine, at least one hand is always available for steering the craft to which the motor is secured. Thus, the outboard motor of this invention provides a measure of safety lacking in some outboards. Further, the large initial expense and maintenance costs and problems of a transmission system are eliminated in the motor of this invention. The invention also provides an engine wherein spark and throttle are always adjusted together to provide maximum efficiency over the range of speed of the engine.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. An outboard motor adapted to reverse in its direction of propulsion without turning upon its steering axis and without interruption of the driving connection between the engine and propeller, comprising a dirigible motor unit having a reversible internal combustion engine, means to control the throttle feed of fuel to said engine, means to shift the spark timing for said engine to accommodate forward and reverse operation of the engine, means to start said engine selectively in either forward or reverse direction, and means to interlock said engine starting means with the throttle control means and the spark timing shift means whereby the throttle control means and the spark timing shift means are automatically set for the selective actuation of said starting means.

2. An outboard motor adapted to reverse in its direction of propulsion without turning upon its steering axis and without interruption of the driving connection between the engine and propeller, comprising a dirigible motor unit having a reversible internal combustion engine, a clamp bracket adapted to mount said unit upon a boat and having a pivotal connection with a horizontal axis to provide for rearward tilting of the unit, an underwater propulsion unit at the lower end of the dirigible unit and connected to the engine to be driven thereby, means to control the throttle feed of fuel to the engine, means to shift the spark timing for said engine to accommodate forward and reverse operation of the engine, means to start the engine selectively in either forward or reverse direction, means to interlock the engine starting means with the throttle control means and the spark timing shift means whereby the throttle control means and the spark timing shift means are automatically set for the selective actuation of said starting means, and means actuated by said last named means to lock the motor unit to said clamp bracket prior to starting the engine in the reverse direction and thereby prevent tilting of the unit during reverse operation.

3. An outboard motor adapted to reverse in its direction of propulsion without turning upon its steering axis and without interruption of the driving connection between the engine and propeller, comprising a dirigible motor unit wherein the internal combustion engine includes a reversible crankshaft, a distributor for said engine and comprising a rotor and a stator operably disposed to provide the spark for engine ignition, said rotor being driven by the crankshaft to provide ignition in timed relation with engine operation and adapted to rotate in either direction in accordance with crankshaft rotation, means to control the throttle feed of fuel to said engine whereby the engine speed is advanced and retarded, means to rotate the distributor stator with respect to the rotor to advance and retard the spark timing in accordance with engine speed, means to start the engine selectively in either forward or reverse direction, and means to interlock the engine starting means with the throttle control means and the distributor stator rotating means whereby the throttle control means and distributor stator rotating means are automatically set for the selective actuation of the starting means.

4. An outboard motor adapted to reverse in its direction of propulsion without turning upon its steering axis and without interruption of the driving connection between the engine and propeller, comprising a dirigible motor unit wherein the internal combustion engine includes a reversible crankshaft, a distributor for said engine comprising a stator and a rotor, said rotor being mounted on a shaft and being operably disposed with respect to the stator to provide the spark for engine ignition, said rotor shaft being driven by the crankshaft to provide ignition in timed relation with engine operation, lost motion means provided between the rotor shaft and the crankshaft whereby ignition timing is maintained for either direction of crankshaft rotation, means to control the throttle feed of fuel to said engine whereby the engine speed is advanced and retarded, means to rotate the distributor stator with respect to the rotor to advance and retard the spark timing in accordance with engine speed, means to start the engine selectively in either forward or reverse direction, and means to interlock the engine starting means with the throttle control means and the distributor stator rotating means whereby the throttle control means and distributor stator rotating means are automatically set for the selective actuation of the starting means.

5. An outboard motor adapted to reverse in its direction of propulsion without turning upon its steering axis and without interruption of the driving connection between the engine and propeller, comprising a dirigible motor unit wherein the internal combustion engine includes a reversible crankshaft, a clamp bracket adapted to mount said unit upon a boat and having a pivotal connection with a horizontal axis to provide for rearward tilting of the unit, an underwater propulsion unit at the lower end of the dirigible unit and connected to the engine to be driven thereby, a distributor for said engine and comprising a rotor and a stator operably disposed to provide the spark for engine ignition, said rotor being driven by the crankshaft to provide ignition in timed relation with engine operation and adapted to rotate in either direction in accordance with crankshaft rotation, means to control the throttle feed of fuel to said engine whereby the engine speed is advanced and retarded, means to rotate the distributor stator with respect to the rotor to advance and retard the spark timing in accordance with engine speed, means to start the engine selectively in either forward or reverse direction, means to interlock the engine starting means with the throttle control means and the spark timing shift means whereby the throttle control means and the spark timing shift means are automatically set for the selec-

tive actuation of said starting means, and means actuated by said last named means to lock the motor unit to said clamp bracket prior to starting the engine in the reverse direction and thereby prevent tilting of the unit during reverse operation.

6. An outboard motor adapted to reverse in its direction of propulsion without turning upon its steering axis and without interruption of the driving connection between the engine and propeller, comprising a dirigible motor unit wherein the internal combustion engine includes a reversible crankshaft, a distributor for said engine comprising a stator and a rotor, said rotor being mounted on a shaft and being operably disposed with respect to the stator to provide the spark for engine ignition, said rotor shaft being driven by the crankshaft to provide ignition in timed relation with engine operation, a gear mounted loosely on said rotor shaft and adapted to rotate relative thereto, means associated with said gear to control the throttle feed of fuel to said engine, means connecting said gear to the distributor stator whereby rotation of the gear to control throttle feed effects corresponding rotation of the stator to advance and retard spark timing, rack means to rotate said gear, means to start the engine selectively in either forward or reverse direction, and means to interlock the engine starting means and the rack means whereby the throttle feed and spark timing advance are automatically set for the selective actuation of the starting means.

7. In an outboard motor mounting, a reversible internal combustion engine provided with electric motor starting means to crank the engine selectively in either forward or reverse direction to start the same, means to control the throttle feed of fuel to the engine, means to shift the spark timing for the engine, an interlock means comprising manually operable lever means, slidable means disposed adjacent said lever means to be actuated thereby and operably connected to the means to control the throttle feed of fuel to the engine and the means to shift the spark timing for the engine, separate starting switch means adjacent said lever means for forward and reverse engine starting and means associated with said lever means and being selectively operable to close the forward and reverse starting switch means to start the starting motor and crank the engine in the desired direction.

8. In an outboard motor mounting, a reversible internal combustion engine provided with electric motor starting means to crank the engine selectively in either forward or reverse direction to start the same, means to control the throttle feed of fuel to the engine, means to shift the spark timing for the engine, and interlock means comprising a control box having an opening therein, manually operable handle means extending through said opening and into the box, rack means slidably disposed in said box and operably connected to the means to control the throttle feed of fuel to the engine and the means to shift the spark timing for the engine and being actuated by said handle means, said box having spaced idling stop means corresponding to forward and reverse operation of the engine and being selectively engageable by said handle means to set the rack means for idling operation of the engine, separate starting switch means corresponding to forward and reverse engine starting provided in said box, and manually operable plunger means mounted in said handle means and being adapted to selectively close the forward and reverse starting switch means to actuate the starting motor and crank the engine in the desired direction when the handle means is disposed in the corresponding idling position.

9. In an outboard motor mounting, a reversible internal combustion engine provided with electric motor starting means to crank the engine selectively in either forward or reverse direction to start same, means to control the throttle feed of fuel to the engine, means to shift the spark timing for the engine, an interlock means comprising a control box having an elongated opening therein, spaced and aligned idling stop means corresponding to forward and reverse direction of operation of the engine provided in said box, rack means slidably disposed in said box and operably connected to the means to control the throttle feed of fuel to the engine and the means to shift the spark timing for the engine, manually operable handle means extending through said opening into the box and being selectively movable to engage said idling stop means to set the rack means for idling operation of the engine in a preselected direction, biasing means associated with the handle means to maintain the handle means in alignment with the idling stop means, separate starting switch means for the electric motor starting means and corresponding to forward and reverse engine starting provided in said box, manually operable plunger means mounted in said handle means and being adapted to close the switch means corresponding to the preselected idling position to actuate the starting motor and crank the engine in the preselected direction, and aligned maximum running stop means spaced from the corresponding idling stop means and corresponding to forward and reverse direction of engine operation provided in said opening and being offset from the idling stop means, said handle means being movable from a position in alignment with the idling stop means to a position in alignment with the maximum running stop means against the force of said biasing means to disengage the handle means from the preselected idling stop means and being further movable over a spaced range between the preselected idling stop means and the corresponding maximum running stop means to actuate the rack and control the engine in the preselected direction of operation and at preselected speeds.

10. In an outboard motor, a clamp bracket assembly adapted for securement to the transom of a boat, a dirigible motor unit carried by the bracket assembly and having a reversible internal combustion engine, interlock means for selectively starting and controlling the engine in the forward and reverse direction of engine operation, a rotatable shaft member carried by the motor unit adjacent to the clamp bracket assembly, means carried by the shaft member and engageable with the clamp bracket assembly upon rotation of the shaft member to secure the motor unit to the bracket assembly, and means operable by the interlock means to rotate the shaft member and secure the motor unit prior to starting the engine for reverse operation.

11. In an outboard motor, a clamp bracket assembly adapted for securement to the transom of a boat and having a rod member, a dirigible motor unit carried by the bracket assembly and having a reversible internal-combustion engine, interlock means for starting and controlling the engine in the forward and reverse directions of operation selectively, a rotatable shaft member carried by the motor unit adjacent to and paralleling the rod member on the clamp bracket assembly, securement means carried by the shaft member and engageable with the rod member upon rotation of the shaft member, and means operable by the interlock means to rotate the shaft member and secure the motor unit to the clamp bracket assembly prior to starting the engine for reverse operation.

12. In an outboard motor, a clamp bracket assembly adapted for securement to the transom of a boat and including a rod member, a dirigible motor unit pivotally carried by the bracket assembly on a horizontal pin and having a reversible internal combustion engine, interlock means for starting and controlling the engine in the forward and reverse directions of operation selectively, said motor tending to pivot on said horizontal pin during reverse operation of said engine, a rotatable shaft member carried by the motor unit adjacent to and parallel to the rod member on the clamp bracket assembly,

means carried by the shaft member and engageable with the rod member upon rotation of the shaft member to secure the motor unit to the bracket assembly, crank means carried by the shaft member, a vertically movable member carried by the motor unit, connecting means disposed between the crank means and the movable member and serving to rotate the shaft member when the movable member is moved vertically, lift means to move the movable member vertically, lever means pivotally carried by the motor unit and operably connected to said interlock means to actuate the lift means and secure the motor unit to the bracket assembly when the interlock means is selectively set for operating the engine in the reverse direction, and lost motion means between said

lever means and said lift means providing relative movement therebetween when the interlock means is selectively set for operating the engine in the forward direction.

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