

March 17, 1959

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2,877,733

ELECTRIC STEERING AND POWER CONTROL SYSTEM FOR OUTBOARD MOTORS

Filed Jan. 22, 1957

3 Sheets-Sheet 1

Fig. 2

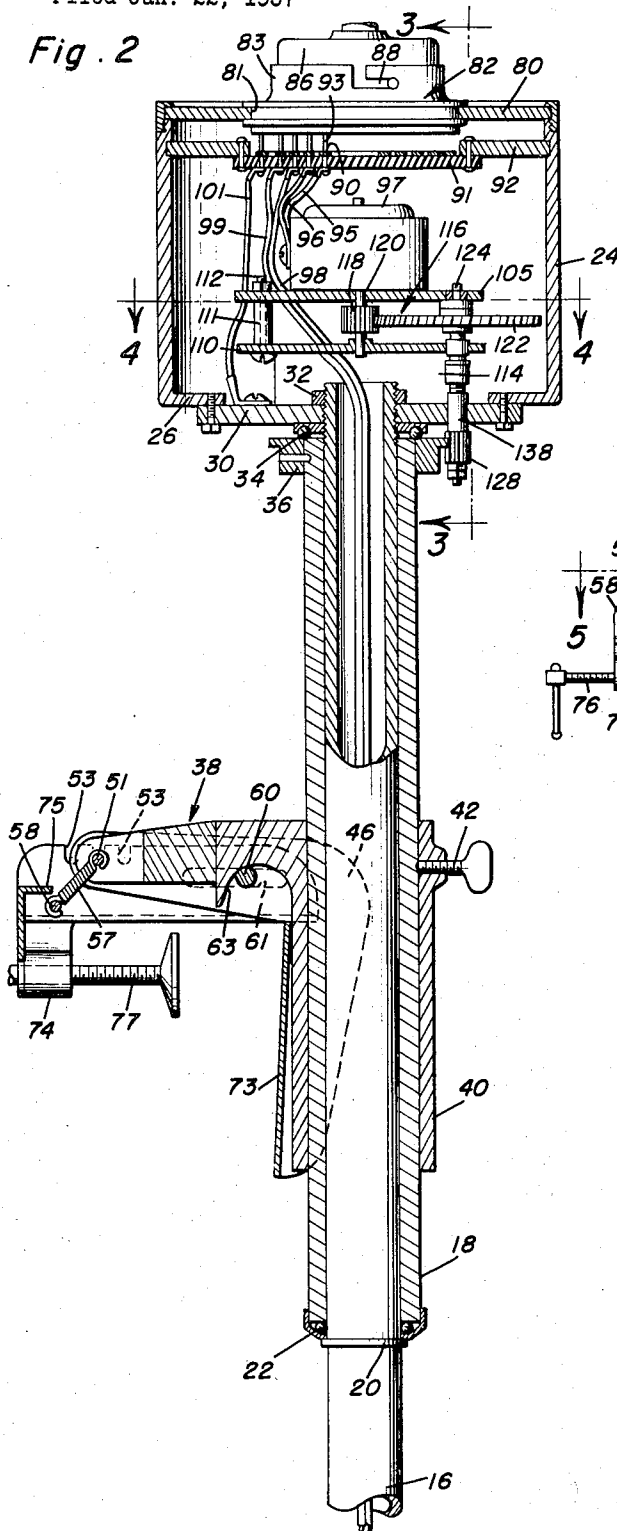
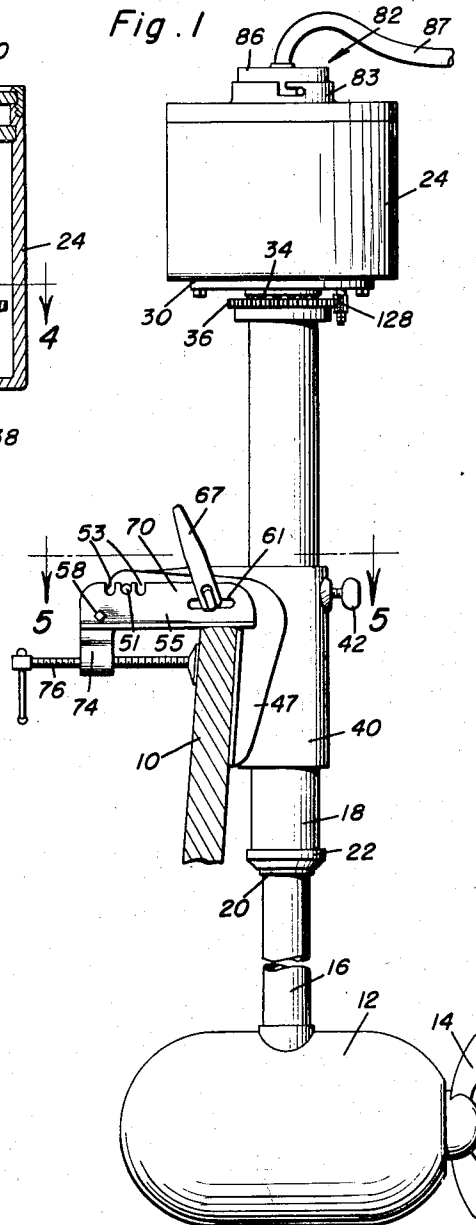


Fig. 1



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Fig. 3

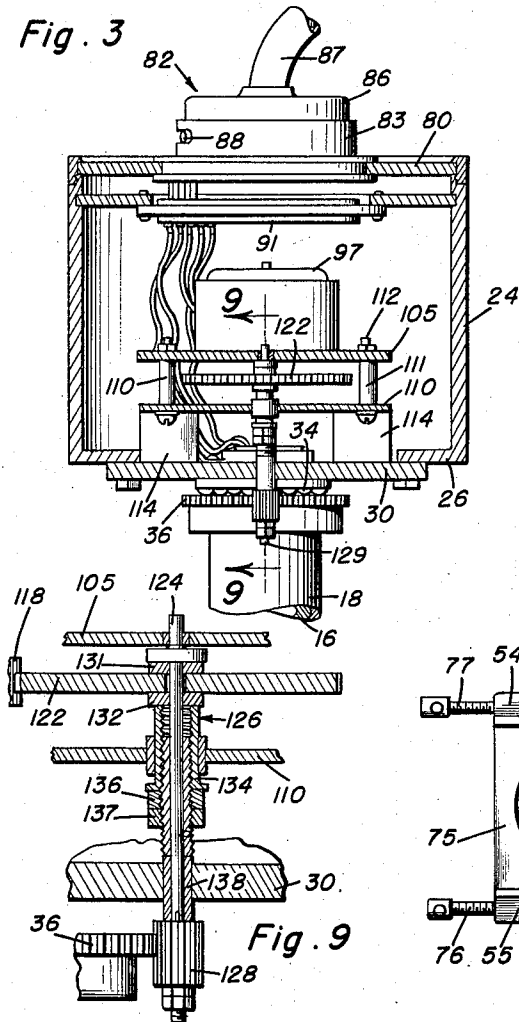


Fig. 4

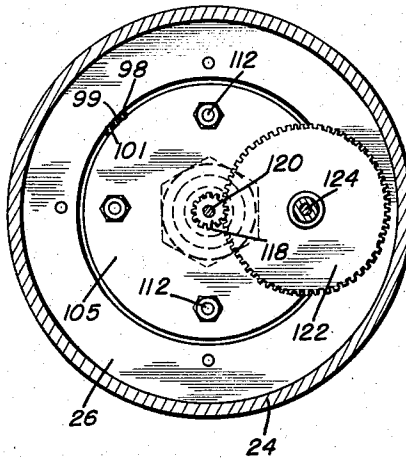


Fig. 5

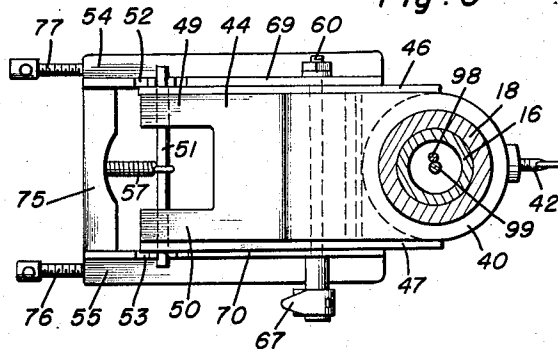
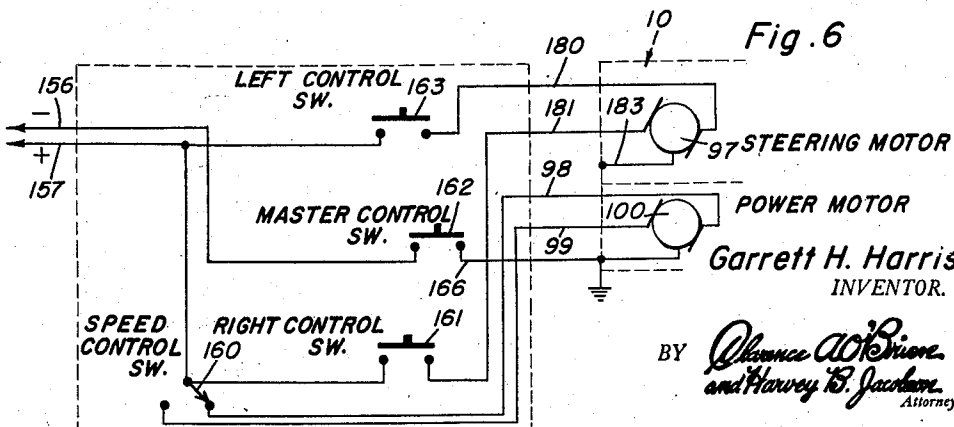


Fig. 9



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Fig. 7

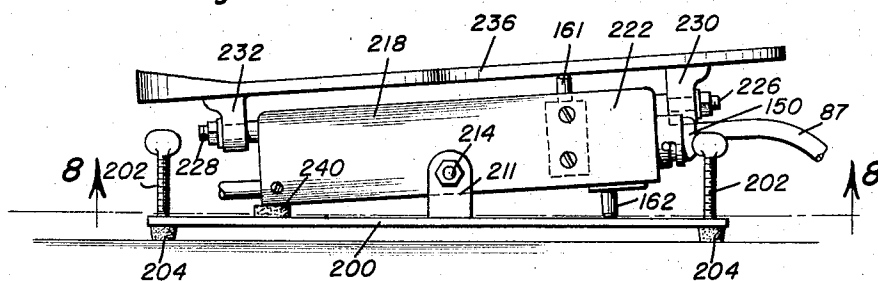


Fig. 8

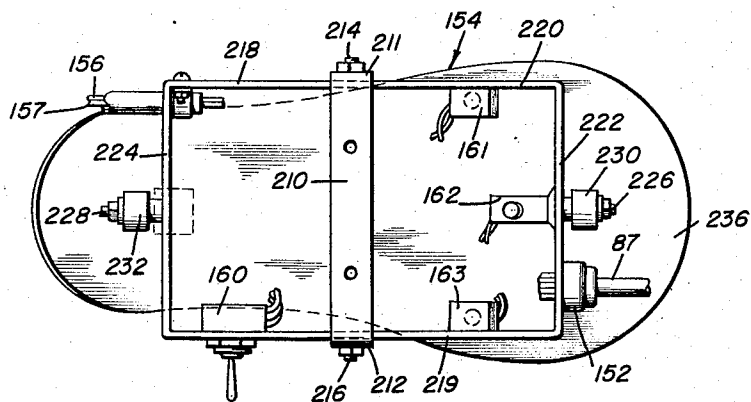
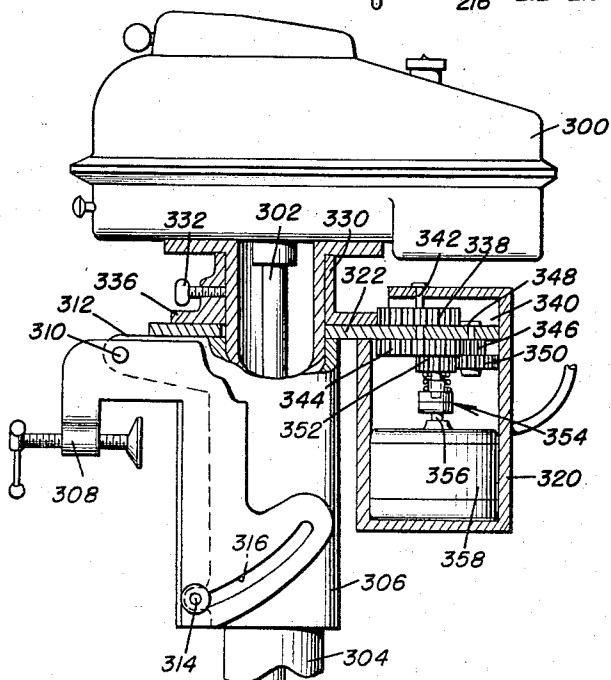


Fig. 10

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2,877,733

ELECTRIC STEERING AND POWER CONTROL SYSTEM FOR OUTBOARD MOTORS

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Application January 22, 1957, Serial No. 635,192

3 Claims. (Cl. 115—18)

This invention relates to devices for steering and powering boats and more particularly to an electrical system for conveniently controlling the direction of travel of the boat.

An object of the invention is to provide a steering control system for a small boat wherein the outboard motor is revolved by electrical power in response to the depression of a foot pedal in a direction that it is desired to have the boat travel. This is attained regardless of the type of outboard motor that is used, the most common being gasoline motors and electric motors.

A further object of the invention is to include in the same foot pedal control means for governing the speed at which the boat is propelled through the water so that not only will the boatsman be able to control the direction of travel of his boat, but he may also be able to control the speed at which the boat is propelled through the water without manual adjustment of any type. In this way both hands are completely free for fishing or other pleasures or duties.

A further object of the invention is to provide a practical device capable of being applied to many small boats, wherein the device is capable of exercising a steering control over the outboard motor, and in many instances where the outboard motor is electrically operated, the device is capable of exercising speed control from zero to maximum, all of the control functions being centered at a foot pedal which does not require the use of the hands.

In my prior Patent No. 2,545,086, I describe a device for turning the power on and off by means of two switches operated by a foot pedal and also a mechanical means to deflect the outboard motor driven propeller axis so as to exercise control for the boat. Although the invention described in that patent is successful for the purposes intended, it is an object of this invention to provide a more versatile device and one which is wholly power operated, enabling the device to be used more easily. In addition, another object is to provide such an improved device which is capable of additional functions and which is equally applicable to electric outboard motors and gasoline outboard motors.

Where in my prior patent the motor guide was principally useful with small fishing boats of the amateur fisherman, my present invention, being power operated, has a wider application in that it is perfectly useful with larger boats of the type which have outboard motors. At the present time outboard motors are being installed on cabin-type craft up to twenty-five or thirty feet long. It is intended that adaptations of the invention described herein may be used in connection with craft of this size as well as the more common smaller craft.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as are more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

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Figure 1 is an elevational view of an outboard motor embodying the principles of the invention and showing the same applied to the transom of a boat;

Figure 2 is an enlarged, fragmentary, vertical sectional view of the device in Figure 1, parts being shown in elevation;

Figure 3 is a sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a transverse, sectional view taken on the line 4—4 of Figure 2;

Figure 5 is a transverse, sectional view taken on the line 5—5 of Figure 1 and showing principally the clamp by which the outboard motor is held on the boat;

Figure 6 is a schematic wiring diagram;

Figure 7 is an elevational view of the foot control which is used by one foot of the boatsman in order to exercise the complete control of the outboard motor, both as to speed and direction;

Figure 8 is a bottom plan view of a part of the foot control of Figure 7 and taken approximately on the line 8—8 of Figure 7;

Figure 9 is an enlarged, fragmentary, sectional view taken on the line 9—9 of Figure 3 and showing but one of numerous types of slip clutches which may be used as a safety precaution in the power train of the outboard motor; and

Figure 10 is a fragmentary, elevational view with parts shown in section, this being a modification wherein a gasoline powered outboard motor is adopted as the means for propelling the boat but controlled in direction by the control of Figure 7 or one similar to it.

In the accompanying drawings, there is an outboard motor mounted on the transom 10 of a boat. It is understood that the outboard motor need not necessarily be mounted on the transom 10 but may be mounted on the gunwale at any point thereof, depending on the type of boat that is involved and the prerogative of the user. The outboard motor is made of an electric motor in casing 12, the electric motor driving a propeller 14. Various standard attachments may be applied, for example, a weed guard, but since this and other attachments like it are not directly a part of the invention, such attachments are not illustrated. Vertical shaft 16 is secured to the top of the motor casing 12 and passes through the bore of hollow column 18. Collar 20 is fixed on shaft 16 and accommodates an anti-friction bearing 22 on which the lower extremity of column 18 is supported. The upper end of shaft 16 is threaded and housing 24 is attached to the threads. The housing has a side wall and a bottom formed of an inwardly directed flange 26 to which mounting plate 30 is bolted or otherwise secured. The mounting plate has a central opening through which the threaded end of shaft 16 passes and there is a nut 32 thereon. Anti-friction bearing 34 is threaded on the end of shaft 16 beneath mounting plate 30 and seats on the top surface of the upper end of column 18 and/or the upper face of gear 36, the latter being fixed to column 18. By this construction, a rigid connection is established between housing 24 and shaft 16 and both of these parts are rotatable in respect to the column 18. However, note that gear 36 is fixed to column 18 for reasons to be described subsequently.

Clamp 38 is attached to column 18 in such manner that it is capable of being adjusted thereon. The clamp has a sleeve 40 through the bore of which column 18 passes, and there is a set screw 42 carried by sleeve 40 and bearing on the outer surface of the column 18. Accordingly, the column 18 is vertically adjustable. By loosening set screw 42 and sliding column 18 to the desired position, the boatsman has control over the depth at which the propeller 14 operates.

Laterally extending plate 44 is fixed to the sleeve 40

and has sides 46 and 47 which are fixed thereto and which are fixed to the sleeve 40. Plate 44 has ears 49 and 50 at its outer extremity in which spindle 51 is supported. The ends of the spindle are disposed in the upwardly facing notches 52 and 53 on the upper edges of clamp plates 54 and 55 and thereby establish an axis about which the entire motor may be swung to place it in the operative or inoperative position. Spring 57, which is secured at one end to spindle 51 and which is secured at the other end to a support spindle 58 on clamp sides 55 and 54, holds the spindle 51 seated in the notches 52 and 53. Rod 60 is passed through aligned slots 61 in flanges 69 and 70 and also in holes in the side plates 46 and 47. A downwardly opening recess 63 formed on the lower surface of plate 44, nests with stop rod 60, establishing a downward limit for the outboard motor by virtue of slots 61. The position of stop rod 60 is adjustable enabling the selection of upwardly opening notches 52 and 53 to be utilized to the full extent. Stop rod 60 has a handle 67 on one end and nuts on the other end and is used to firmly clamp the sides 46, 47 and the upstanding flanges 69 and 70 of sides 54 and 55 together.

A flat plate 73, with or without padding, extends across the sides 46 and 47 and is adapted to abut the outside surface of the boat transom 10. Depending threaded bearings 74 on the sides 54 and 55 that are connected by supporting member 75 accommodate the two screws 76 and 77 which are used in C-clamp fashion for attaching onto the boat gunwale 10.

Housing 24 has a top wall 80 with an aperture 81 accommodating the rotatable cable connector 82. The female part 83 of the cable connector is carried by the top wall 80, while the male part 86 is attached at the end of cable 87, the latter being a multi-conductor cable. A bayonet latch 88 or a like connection is made between the male and female parts 83 and 86 respectively of the connector 82.

Since five conductors are required in the electrical circuit, there are five slip rings 90 carried by the insulating support 91, the latter being attached to inwardly directed flange 92 in housing 24. Five pins 93 depend from the female part 83 of the cable connector 82 and ride on the slip rings 90. Wires 95 and 96 extending from two of the slip rings are operatively connected to motor 97. This motor is the steering motor, whose torque is used to oscillate housing 24 and shaft 16 within the column 18. Two wires 98 and 99 are attached to two other slip rings and are operatively connected to the motor 100 in motor casing 12. This motor is a multi-speed motor. The final slip ring has wire 101 connected with it, the latter being secured to mounting plate 30 in order to establish a common ground for both motors 97 and 100. Wires 95 and 96 may extend directly to the motor 97 that is mounted on a support plate 105 in housing 24. However, wires 99 and 98 pass through the bore of shaft 16 and into the motor casing 12 for connection to motor 100. The support plate 105 is mounted above a parallel support plate 110 and held spaced therefrom by means of spacers 111. Bolts 112 extend through aligned holes in the plates 105 and 110 and through the spacers 111, holding the two plates arranged together as a unit. Stands 114 are attached to the mounting plate 30 and rise therefrom. The upper ends of the stands are secured to mounting plate 110, holding it fixed within the housing 24.

The two plates 105 and 110 support a gear train 116, the latter being made of a pinion 118 on the shaft 120 of motor 97. The shaft is mounted in aligned bearings in plates 105 and 110 (Figure 2). Gear 122 is enmeshed with pinion 118 and is freely rotatable on shaft 124 (Figure 9). A slip clutch 126 drivingly connects gear 122 to shaft 124 in order to establish a drive between gear 122 and pinion 128 which is secured to the lower end of shaft 124 and on the exterior of housing 24. The slip clutch 126 is but one of a number of variations which

may be used. The clutch is made of two fiber washers 131 and 132 on opposite faces of the gear 122 and brought to bear against these faces by means of the concentric collars 134 on shaft 124, the collars being held in their adjusted positions by means of a pair of nuts 136 and 137 on the concentric sleeves of collars 134. The lower end of shaft 124 is passed through a bushing 138 which is fixed to the mounting plate 30 and beneath which pinion 128 is located. This pinion engages the previously described gear 36 so that upon energization of motor 97, such to cause its shaft 120 to rotate, the gear train causes the housing 24 to move rotatably about gear 36. The pinion 128 walks around the periphery of gear 36 in response to rotation of shaft 120. Therefore, the shaft 16 which supports motor case 12 is adjustable in response to actuation of motor 97, and since this motor is reversible, the boat on which the device is mounted may be steered either to the left or to the right, depending on the direction of movement of the shaft 120 of motor 97. Should occasion demand, as propeller 14 striking an immovable object, the overriding clutch 126 will prevent the motor from burning or causing more serious damage.

The opposite end of cable 87 has a plug 150 connected with it, this plug being separably mounted in socket 152 on the foot control 154 (Figures 7 and 8). Two wires 156 and 157 extending from the positive and negative posts of a storage battery are attached to the foot control, and they are operatively connected to the socket 152 as are the wires from four switches 160, 161, 162 and 163 (Figure 8). Reference is now made to Figure 6 for an explanation of the functions of the switches and their relationship to the motors 97 and 100. The wire 157 from the source of electrical energy is attached to one contact of the left control switch 163, one contact of the right control switch 161, as well as the two-position speed control switch 160. This switch is manually operated to the high or low speed positions for the power motor 100. Wire 156 is attached to the switch arm of the master (on-off) switch 162. Wires 98 and 99 are connected respectively to the fixed contacts of switch 160 and to the two windings of the two-speed electric motor 100, while this motor is connected to ground through the structure of the outboard motor. Wire 166 extends from the other terminal of switch 162 and to the power motor 100 and to ground.

Steering motor 97 has wires 180 and 181 extending from the separate windings terminals to the other contacts of switches 163 and 161, respectively, and a wire 183 to ground. Accordingly, switches 161 and 163 cause the motor 97 to be energized in order to rotate the shaft 120 either clockwise or counterclockwise, while switch 162 controls the energization of the power motor and switch 160 controls the rate at which motor 100 is operated.

Foot control 154 has a triangular base 200 in the corners of which there are three screws 202 with feet 204 at their lower ends. Adjustment of the screws 202 will enable the foot control 154 to be suited to the bottom of the boat. A U-shaped, transverse support 210 is attached to the base 200 and has sides 211 and 212 which extend upwardly, accommodating the trunnions 214 and 216. These trunnions are attached to the sides 218 and 219 of frame 220 between the ends thereof. The ends 222 and 224 of the frame support aligned trunnions 226 and 228, the latter being carried by depending brackets 230 and 232 near the toe and heel parts of foot pedal 236. When the foot pedal 236 is rocked about the axis of trunnions 214 and 216, switch 162 is actuated, since it is carried by frame 222 and the actuator of the switch is brought against the base plate 200. A rubber stop 240 is attached at the rear end of the frame 222 or attached to the top surface of the base plate 200 to cushion the return movement of the foot pedal and frame inasmuch as these two parts move in unison when

rocked about the axis of trunnions 214 and 216. The switch 162 need not be an on-off switch as schematically represented in Figure 6. It may be a multiple stroke push button type switch such as those now commonly used as dimmer switches for the head lamp circuits of automotive vehicles. In this way, the motor 100 controlled by switch 162 may be turned on by a cycle of operation of pedal 236 and remain on until another cycle of the foot pedal is completed.

Tilting one's foot to the left will cause the switch 163 to operate, because it is carried by the side 219 of the frame 222 and the push button thereof is operated by foot pedal 236. By tilting of the foot of the user in the opposite direction, the foot pedal 236 oscillates about the common axis of trunnions 226 and 228, causing the right turn switch 161 to close. These cause the motor 97, which is the steering motor, to be energized.

Reference is now made principally to Figure 10 where one modification is illustrated. This modification involves a gasoline powered outboard motor 300 whose shaft 302 extends through column 304. This vertical column has sleeve 306 adjustably mounted thereon for the same reason that sleeve 40 is adjustably mounted on column 18 in the embodiment of Figure 1. C-clamp 308 is connected with sleeve 306 by having transverse pivot 310 pass through the body of the C-clamp and through aligned openings in the sides 312 which protrude laterally from sleeve 306 at the upper end thereof. Transverse pin 314 extends through a pair of slots in the sides inasmuch as pin 314 is attached to the sleeve 306 and movable through the arcuate slots 316 in the sides of the body of the clamp, the outboard motor may be swung to an inoperative position and held in place by tightening a nut that is threaded on the end of the pin 314.

Housing 320 is mounted on a plate 322, the latter being secured to the sleeve 306. Collar 330 is mounted on column 304 and has a set screw 332 carried thereby which is in frictional contact with the surface of the column. By means of set screw 332, an adjusted position of the sleeve 306 may be held. The lower end of collar 330 has a gear 336 whose teeth are enmeshed with gear 338, the latter constituting a part of a gear train 340 in housing 320.

A part of plate 322 accommodates shaft 342 on which gear 338 is fixed, there being another gear 344 also fixed to shaft 342, but being on the opposite side of plate 332. Pinion 346 is mounted on a shaft 348 that is carried by plate 332 and is enmeshed with gear 344. Another gear 350 fixed for rotation with pinion 346 is enmeshed with gear 352. The last gear 354 is driven by one element of the slip clutch 352, the other element being driven by the shaft 356 of motor 358.

In operation, the motor 358 which corresponds in function and structure to the steering motor 97 is energized to cause the shaft 356 thereof to turn clockwise or counterclockwise. This drives the slip clutch 354, gear train 340 causing the collar 336 to be rotated, thereby rotating column 304 therewith.

The foot control as hereinbefore described may be used with the embodiment of Figure 10 or any other satisfactory means of actuating the proper directional control switches such as a steering wheel or control lever. Also, a variable speed steering motor with variable speed control switches for same may be used as necessary or desired.

The foot control in use with the embodiment of Figure

10 is simplified so that only the left and right turn switches are necessary. In place of the switch 162 a Bowden wire may be used to actuate the throttle control of the outboard gasoline motor or the standard control on the outboard motor may be used in the unaltered condition.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

15 What is claimed as new is as follows:

1. In an outboard motor which has a concentric shaft and column and a steering motor, means drivingly connecting said steering motor to said column to adjustably rotate said shaft, a foot operated control which has a foot pedal, means mounting said foot pedal for oscillation about intersecting axes, left turn and right turn switches constituting a part of said control and mounted for actuation by said foot pedal in response to left and right depressions of the foot pedal, electrical conductors extending from said switches to said steering motor, means to connect said switches to a source of electrical energy, an electric power motor which operates at variable speeds, manually operated means to select the speed at which the power motor is operated, and a control switch operatively connected with said control.

2. In an outboard motor the combination of a clamp, a reversible steering motor, a shaft, means securing said steering motor to said shaft, structural means to which said clamp is secured to support the outboard motor, means including a gear train and slip clutch drivingly connecting said steering motor to said structural means so that upon energization of said steering motor said shaft is rotated with respect to said structural means in either direction depending on the direction of rotation of said steering motor, a foot control including a foot control pedal mounted for oscillation about a first axis, switches actuated by said foot pedal in response to oscillation to the left and right respectively about said first axis, an electrical circuit including said switches and said reversible steering motor so that said steering motor is energized in response to oscillation of said foot pedal in the same direction that the boatsman desires the boat to be steered, means mounting said pedal for adjustment about a second axis, motor actuation control means operatively connected with the outboard motor and said pedal and responsive to movement of said pedal about said second axis, and motor speed control means operatively connected with said outboard motor.

3. The combination of claim 1 wherein said means drivingly connecting said steering motor to said column include a gear train having an overriding slip clutch.

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