

[54] **OUTBOARD PROPULSION TROLLING ASSEMBLY**

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[51] Int. Cl. **B63h 21/26**

[58] Field of Search **115/17, 18, 41, 35, 34 R; 248/4**

[56] **References Cited**

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Primary Examiner—Trygve M. Blix

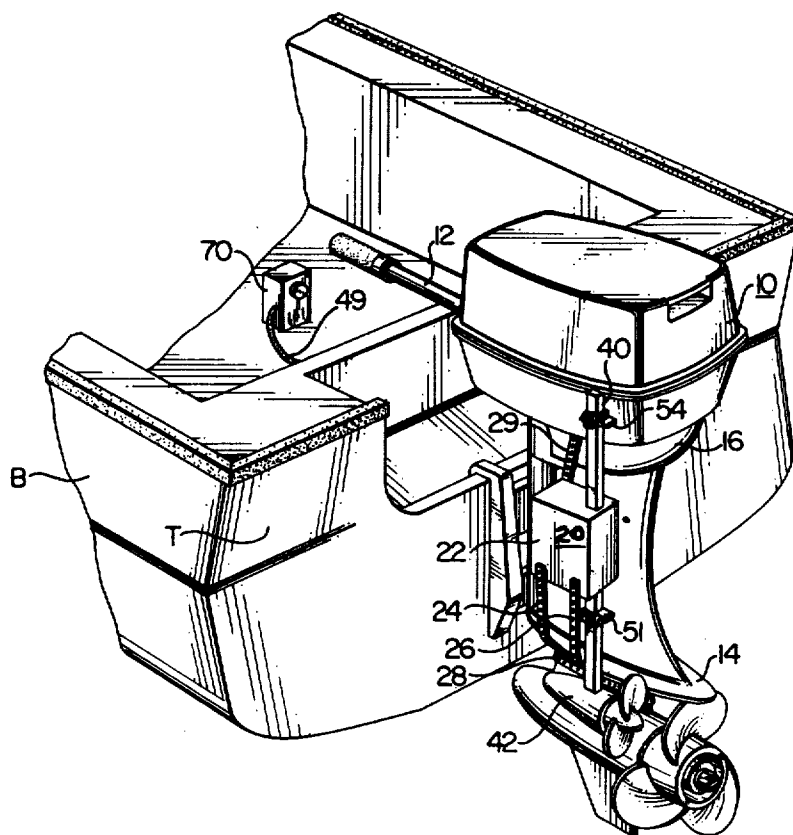
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[57] **ABSTRACT**

Boat propulsion apparatus including a main outboard motor mounted on a transom for driving and steering the boat at cruising speeds and including an electric outboard motor for driving the boat at trolling speeds which motor is connected with the main outboard motor for steering in unison with the latter, the trolling outboard being mounted so that its submersible motor unit is vertically reciprocable between an idle "up" position and a submerged "down" position and includes a power driven device with limit switches to place it selectively in one position or the other, the trolling outboard being remotely controllable from a control head box as to the speed and direction of its submersible drive motor and as to the "up/down" position of its motor unit, and both outboards being interlocked by way of the limit switches so that the main outboard can not be run with the trolling motor down in drive position and so that the trolling motor can not be run with its submersible motor unit in "up" position.

10 Claims, 5 Drawing Figures



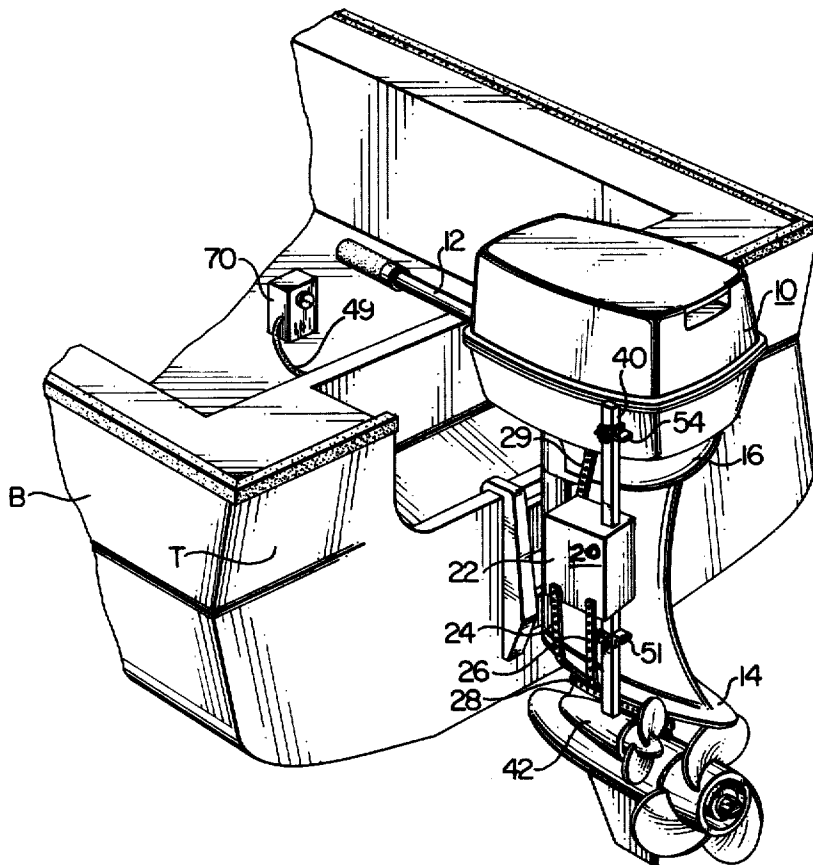


FIG. 1

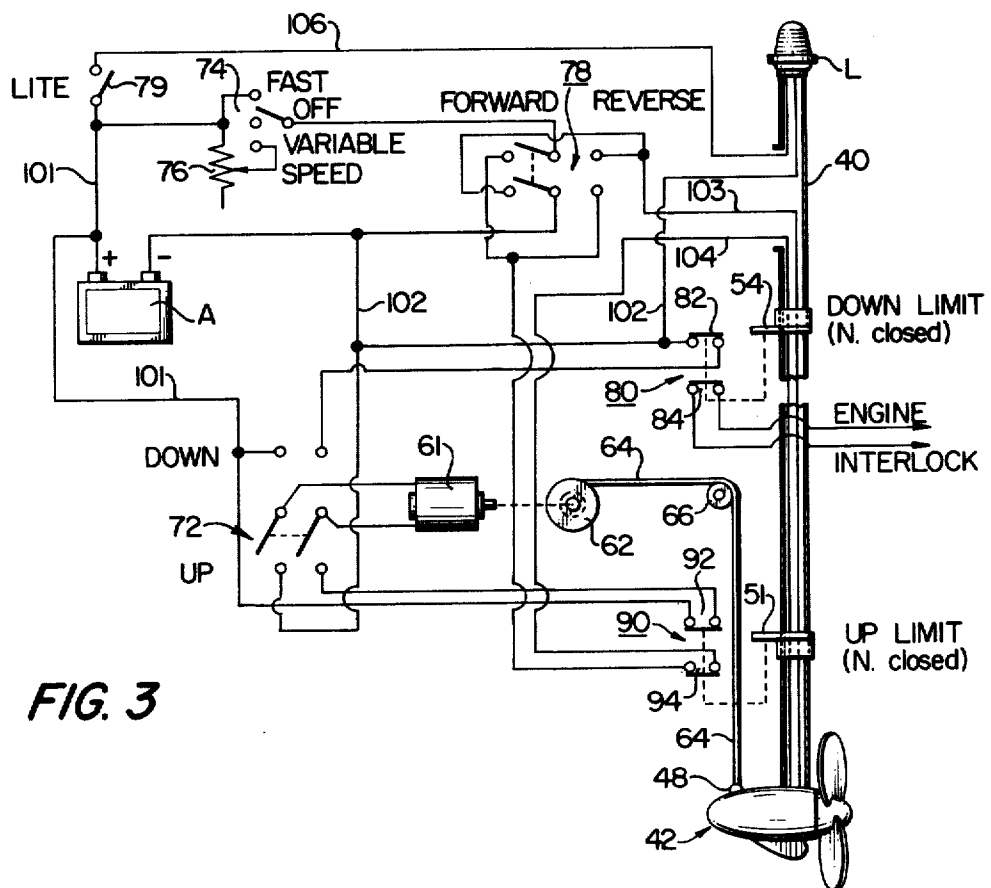
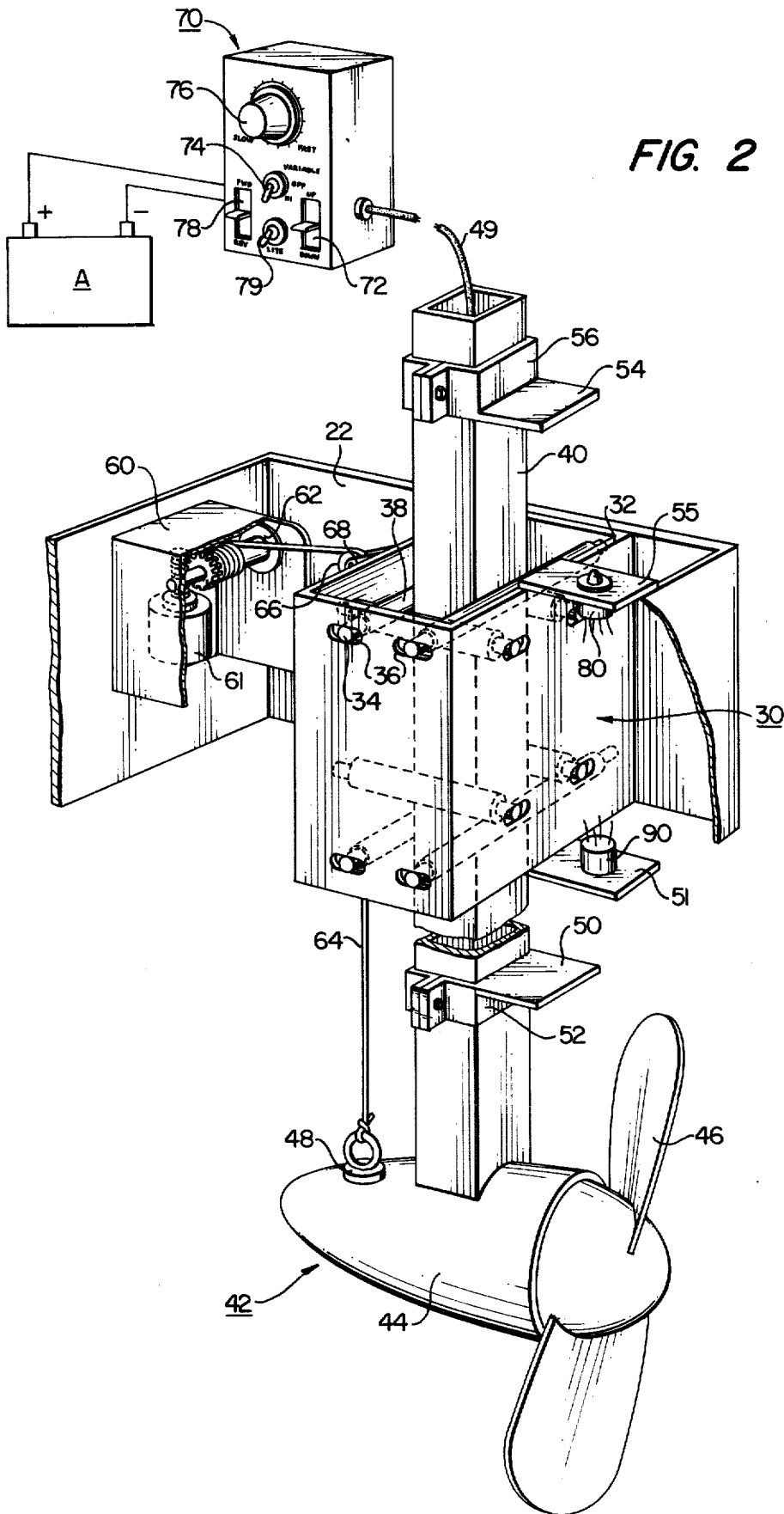
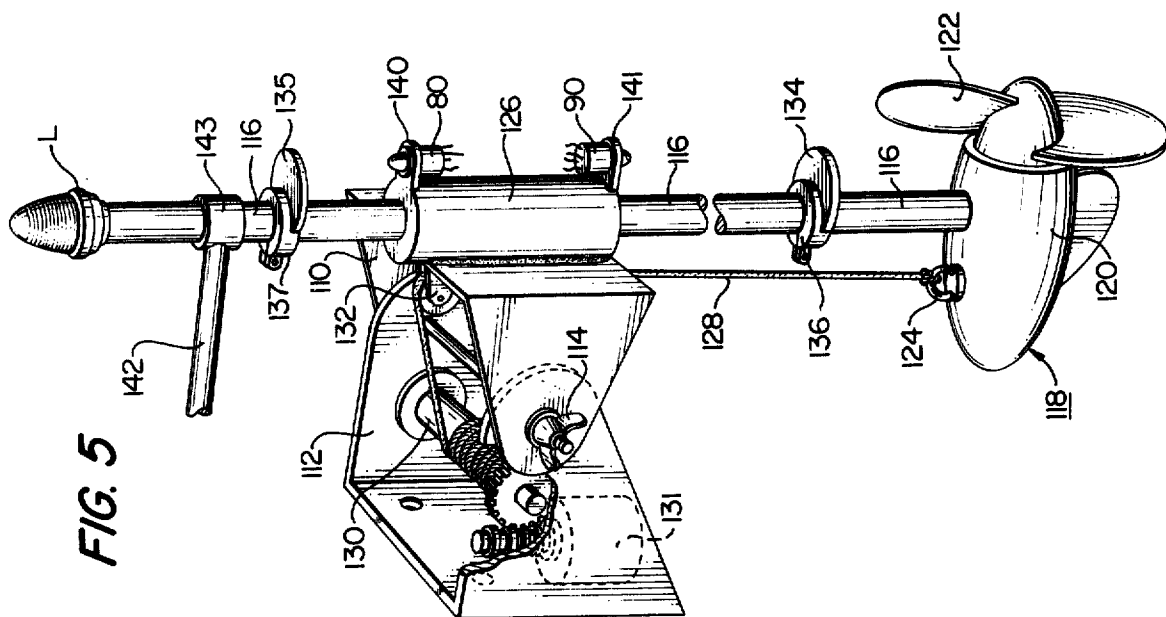
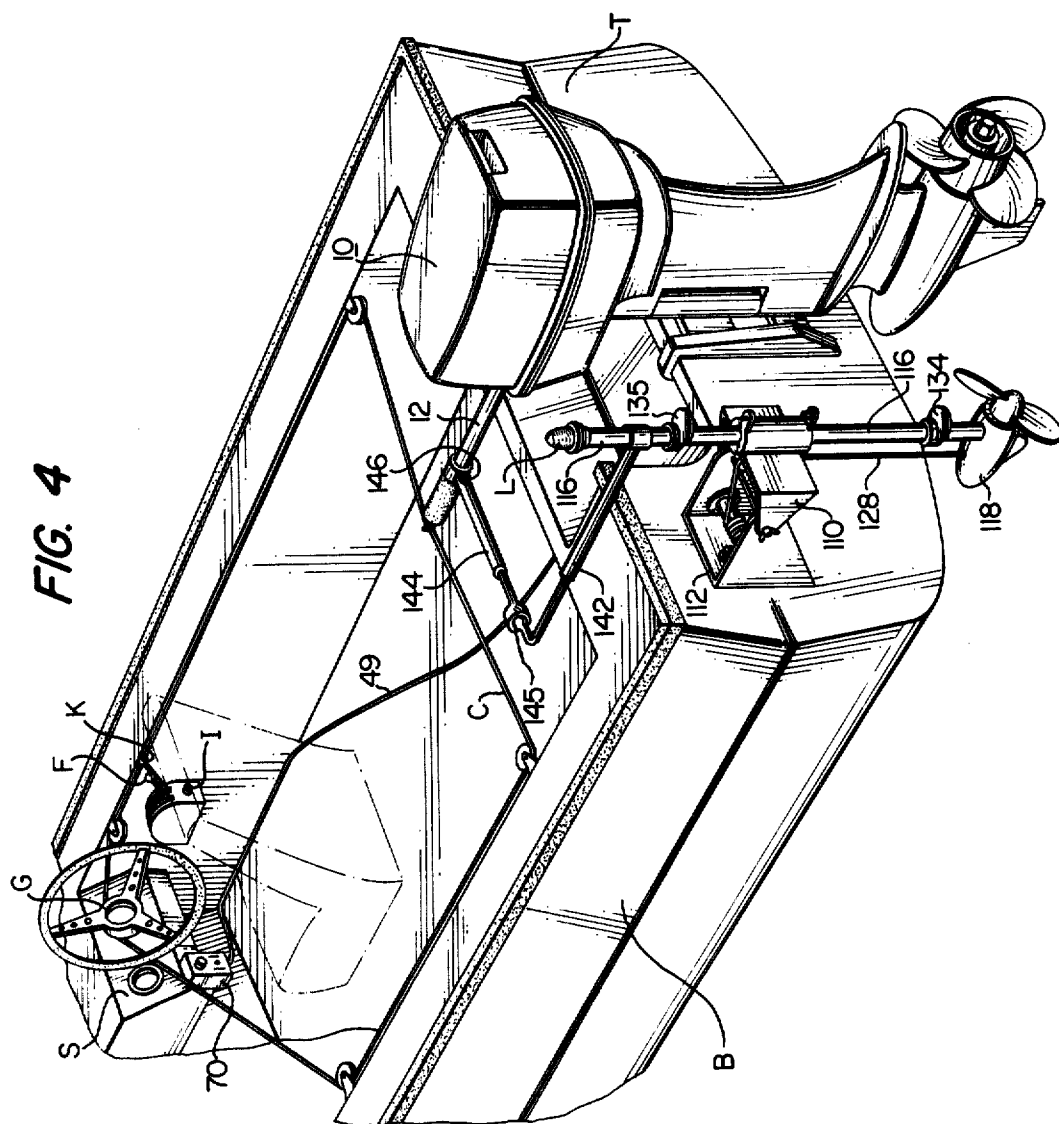


FIG. 3





OUTBOARD PROPULSION TROLLING ASSEMBLY

FIELD OF INVENTION

This invention relates to structure for an improved boat propulsion system including a main outboard motor and a trolling outboard motor mounted for steering in unison and interlocked electrically so that they can not be accidentally damaged by improper operation, and the trolling motor being remotely controllable so that the operator need not change this portion within the boat when he changes from main propulsion to trolling, and vice-versa.

BACKGROUND AND PRIOR ART

It is well known that a gasoline engine outboard, although furnishing ideal propulsion for a boat at cruising speeds, is unsatisfactory as a trolling motor not only because of the noise, vibration and exhaust fumes, but also because it usually can not be run slowly enough to reach trolling speeds. This problem has been overcome by the use of small electric trolling outboards, most of which include a submersible motor and propeller unit on an upright supporting shaft which is rotatably mounted in a bracket clamped to the boat, the submersible unit being movable between a "down" and an "up" position either by tilting as shown in U.S. Pat. Nos. 3,578,277 and 3,698,672, or by vertical sliding as shown in U.S. Pat. No. 2,716,960, or a combination of both as shown in U.S. Pat. Nos. 3,119,365 and 3,245,640, and 3,604,674. U.S. Pat. No. 2,972,328 shows a gasoline outboard motor which can be raised or lowered by tilting between operating and idle positions using its own starter motor to move it between limits.

However, most of these patented solutions have certain drawbacks in that they require a fisherman to leave his fishing position in the boat in order to place the trolling motor in and out of service and control its speed and direction of drive. U.S. Pat. Nos. 2,744,418; 2,895,445; 3,139,853 and 3,567,164 show plural different outboards on the same boat and coupled for unitary steering, but they show no means for remote control, for instance, at the steering location of the larger main propulsion motor. Another serious drawback relates to the ease with which the little trolling outboard can be damaged, especially where it is used alternatively with a gasoline powered main propulsion motor. If the trolling motor is in "down" position when the main propulsion motor is driving the boat, the latter may be easily damaged physically by the prop-wash from the main propulsion outboard, or may be damaged by striking an object or grounding at high speed. Conversely, if the trolling motor is in up-position it may be damaged if it is accidentally turned on and left on while out of the water, since submersible motors rely upon immersion for cooling and will burn up if run out of water. Since the electric motor is virtually silent the fact that it is running while in the up position generally goes unnoticed until too late.

THE INVENTION

This invention improves the structure of the electric trolling outboard motor and interconnects it with the main propulsion outboard motor so that either motor can be selected for use from a remote location in the boat, and interconnection is such that when one outboard has been selected for use the outboards are pro-

tected from damaging each other by accidental improper operation of the controls. Most of the gasoline powered outboard engines of any size are now equipped with electric starting and the motors are usually controlled from a wheel station located forward in the boat so that the weight of the operator helps to balance the weight of the outboard motor. The present invention seeks to provide a small electric trolling motor of improved structure coupled with the main propulsion outboard motor so that the two of them steer in unison, and the small trolling motor being also controllable from a forward position in the boat, probably at the same wheel station from which the operator controls the main propulsion motor. However, the small electric trolling motor is too fragile to be allowed to remain in the water when the boat is being driven by the main propulsion motor, and in addition is subject to being burnt out if it is raised out of the water, but accidentally left running, due to loss of cooling by immersion of the electric motor in the water as required according to factory instructions. At the present time, most electric trolling motors are raised from the water by tilting about their mounting brackets, but before they can be tilted out of the water, the operator must leave the wheel station and go back to the small motor to release the catch which prevents tilting thereof, as is necessary so that the motor can be run in reverse without tilting itself out of the water.

It is therefore an object of the invention to provide an outboard trolling motor mounting in which the motor is not tilted, but instead is raised and lowered into and out of immersed operating position. The submersible electric motor and propeller unit which is at the lower end of the supporting shaft which in turn is carried by the outboard mounting bracket, when made reciprocable vertically in the bracket, permits a mode of raising and lowering of the lower submersible unit such that no latch is necessary in the down position, since the motor drive in any direction is perpendicular to the shaft on which the motor is suspended. Since the anti-tilting latch can thus be eliminated, it is unnecessary for the operator to approach the trolling motor at all in order to raise or lower it.

It is another object of this invention to provide a motor which is vertically reciprocated into or out of operating position using remotely controllable means for raising and lowering the motor. While there are a number of different ways to accomplish this purpose, including positive rack and pinion drives, hydraulic means, etc., the present invention is illustrated by an embodiment in which a stainless steel cable attached to the submersible unit raises and lowers the same against the force of gravity by pulling the cable over a pulley in the outboard mounting bracket. The cable can be directed to the wheel station through a series of pulleys and eyelets within the boat if desired to provide manual operation, but the present invention prefers a small electric winch in the outboard mounting bracket and including a small motor driving a drum on which the cable can be wound or unwound.

It is another object of this invention to provide an interlock switch system including limit switches by which the electric winch which raises and lowers the submersible head is stopped in one of two definite positions with the motor either raised out of the water, or else with the motor in down position in which it drives the boat.

It is another object of the invention to provide additional switches in the two limit-switch positions whereby the drive motor in the submersible unit is disabled and prevented from accidental operation when the submersible unit is in the up position, and whereby the main propulsion motor is disabled and prevented from operation when the submersible unit of the trolling outboard is in down position.

It is a still further object of the invention to provide a system in which the trolling motor is coupled with the main propulsion outboard for steering in unison therewith, whereby the operator can steer both of them from the wheel station, and whereby the main propulsion outboard motor provides supplemental steering when it is turned off and the boat is being driven by the trolling outboard motor. It is a corollary object of the invention to provide means for interconnecting the motors which will not bind the steering regardless of whether the trolling motor is in up or down position.

Still another object of the invention is to provide a system in which the operator can quickly and easily switch back and forth between the two different types of motor so that he can fish efficiently without having to run back and forth in the boat to make frequent changes as are currently necessary to change from one type of propulsion to the other. This capability adds not only to the pleasure and efficiency of the system, but is also a factor of substantial importance from the point of view of the safety of the operator himself, particularly in a small boat, and particularly where he is also handling fishing equipment at the same time.

Other objects and advantages of the invention will become apparent during the following discussion of the drawings, wherein:

FIG. 1 is a prospective view of the aft end of a small boat equipped with a gasoline powered outboard propulsion motor to which an electric trolling motor according to the present invention has been attached;

FIG. 2 is an enlarged view of the outboard trolling motor shown in FIG. 1, and showing the housing partially broken away;

FIG. 3 is an electrical wiring diagram showing a circuit according to the present invention including suitable limit switches, interlock switches, and electric trolling motor controls;

FIG. 4 is a prospective view of the aft end of a boat equipped with a modified type of electric trolling motor mounted to the transom of the boat instead of to the gasoline powered outboard motor; and

FIG. 5 is an enlarged prospective view of the modified trolling motor shown in FIG. 4.

Referring now to the drawings, FIGS. 1 and 4 show a boat B with a main propulsion outboard motor 10 mounted on its transom T by conventional mounting brackets and in a manner well known in the boating art. In FIG. 1, the motor 10 is steered by a steering arm 12 which extends forwardly therefrom and is a part of the motor, but in FIG. 4, the steering arm 12 is connected to a cable C which is wound around the hub of a steering gear G at a wheel station located forward in the boat. At the remote station S in FIG. 4 there is also a control quadrant including a forward-reverse control F and an engine throttle control K of conventional design. At the control station S there is also an ignition and starter switch I, and these controls G, F, K, and I are all used to control the main propulsion outboard motor 10 in a manner well known per se in the art. In

FIG. 1 the motor 10 is controlled by conventional controls mounted on the front of its cover, and not shown in the present drawings.

Referring first to FIGS. 1, 2, and 3, these figures show a first embodiment of the invention in which the trolling outboard which is shown in detail in FIG. 2 and is generally referred to by the reference character 20 is mounted on the lower unit of the outboard motor itself. The trolling outboard includes a frame 22 which also serves as a protective housing, and this frame has mounting brackets 24 and 26 secured to it and extending diagonally downwardly to the lower unit 14 of the main propulsion outboard, where the brackets 24 and 26 are secured to a strap 28 which encircles the lower unit 14. The upper end of the frame 22 is secured to the upper part of the outboard motor by another strap 29 which extends below the cover 16 of the main propulsion outboard and is attached to one of the engine bolts located therewithin.

The housing 22 supports a bearing assembly 30 which can be seen best in FIG. 2, the purpose of this assembly being to support the main shaft 40 of the trolling outboard in vertically reciprocable relationship to the housing 22 and to the main propulsion outboard 10. The bearing assembly 30 is a rectangular elongated structure 32 having 8 roller bearings located inside of it, four at the top and four at the bottom, and these eight bearings guiding and supporting the shaft 40 so as to provide virtually frictionless reciprocation thereof through the bearing assembly 30. Each of the roller bearings comprises a bolt 34 extending through an elongated slot 36 in the structure 32 and each bolt supporting a rotatable needle bearing member 38 as can best be seen near the top of the structure in FIG. 2. As mentioned above, there are eight such bearings, the other seven being shown in phantom line.

The vertical shaft 40 extends down through the bearing assembly and supports a lower submersible unit 42 which includes the housing 44 of the trolling drive motor, a propeller 46, and an eyelet 48. The motor and propeller units 44 and 46 are common purchased items. The wiring for the motor in the housing 44 extends upwardly through the hollow shaft 40 and emerges as a cable 49 which extends to a control head box which will be described hereinafter. The shaft has two adjustable abutments on it, including a lower abutment 50 secured on the shaft in adjustable position by a collar 52 and including an upper abutment 54 which is also adjustable vertically on the shaft 40 and maintained in adjusted position thereon by the collar 56. Abutments 50 and 54 lie opposite two switch supporting plates 51 and 55 which support limit switches to be described presently in connection with FIG. 3. The lower submersible unit 42 and the shaft 40 are raised and lowered while being guided by the bearing assembly 30 using a winch 60 comprising a small electric motor 61 reversibly driving a cable winding drum 62. The cable 64 extends around a pulley 66 secured in a bracket 68 on the side of the bearing assembly 30, so that the motor 61 driven in one direction raises the lower submersible unit 42, and driven in the other direction lowers the submersible unit 42 into its operating position in the water. The limit switches supported on the plates 51 and 55 are used to disable the motor 61 when the unit has reached an adjusted up position, or an adjusted down position whichever way the motor happens to be running at the moment.

The control head box 70 which can be seen in FIGS. 1, 2, and 4 includes an up-down switch 72 used to control the direction of drive of the motor 61, a switch 74 used to control the trolling propulsion motor in the housing 44, this switch turning the motor off in its centered position, turning the motor on for high speed in its lower position, and connecting the motor for variable control in its up position, this variable control being provided by the rheostat 76. A forward-reverse switch 78 controls the direction in which the motor in the housing 44 runs, and a light switch 79 is provided in case a 32-point sternlight is included on the upper end of the motor supporting shaft as shown, for example, in FIG. 5 as will be presently discussed. For present purposes, it is assumed that the battery A shown in FIGS. 2 and 3 is a storage battery which may be the boat's battery and which is probably used also for starting the main propulsion outboard 10 and furnishing its ignition.

Referring now to FIG. 2, it will be seen that the shaft 40 is hollow and that it supports the submersible unit 42 at its lower end as shown in FIG. 2, with the wiring for the motor within the submersible unit 42 brought out of the side of the shaft 40 in a manner well known in electric outboard trolling rigs.

FIG. 3 shows the details of the upper limit switch 80 and the lower limit switch 90, each of which in the present illustrative embodiment comprises a normally closed double-pole single throw microswitch. Battery power is normally furnished to the poles of the double-pole double-throw "up/down" switch 72 from the battery A by way of the wires 101 and 102 so that the winch motor 61 will drive the cable drum 62 in one or the other direction depending on which way the switch 72 is thrown. However, the upper limit switch 82 breaks the flow of current to the motor 61 when the abutment 54 opens the switch 82, meaning that the motor is fully down, and therefore the motor 61 is stopped although leaving the other directional throw of the switch 72 still connected because the switch 92 is closed. Therefore, when it is desired to raise the motor if the switch 72 is thrown to the up position, the winch motor 61 will operate in a direction to wind the cable 64 on the drum 62 until the abutment 51 strikes the switch 90 and opens the contacts 92, thereby stopping the winch motor 61 in the full up position. The rotation of the propulsion motor within the submersible unit 42 is controlled as to direction by the switch 78 which is a double-pole double-throw reversing switch arrangement of conventional design which also receives power from the wires 101 and 102, although the wire 101 can be interrupted by the motor control switch 74 when it is in its center position, thereby stopping the trolling propulsion motor. If the switch 74 is in the down position, and the rheostat 76 introduces an adjustable amount of resistance in series with the trolling propulsion motor so that its speed is variable, using the rheostat 76, but in the up position of the switch 74 the rheostat is eliminated and the trolling propulsion motor in the housing 42 runs at full speed in either the forward or the reverse direction as determined by the switch 78. The motor wire 103 is connected at all times to the reversing switch, but the motor wire 104 passes through a safety switch 94 which is normally closed, and then to the reversing switch 78. The switch 94 is always closed except when the motor is in the full up position, at which time the abutment 51 opens both circuits in

the switch 90 and thereby prevents operation of the electric trolling motor when the motor is not immersed in the water.

As stated above, it is highly undesirable that the gasoline powered main propulsion motor should be allowed to run when the little trolling motor is in the down position, and therefore, the switch 84 is provided as part of the down limit switch 80. The switch 84 is connected to the main propulsion engine, in a manner not shown, and is connected either in series with its ignition system or else in series with its starter system whereby the main propulsion motor can not be operated if the switch 84 is open. This switch is opened when the abutment 54 is in the fully down position in which the trolling outboard is immersed, the switch 84 is allowed to close as soon as the trolling motor is raised out of the water, thereby again enabling operation of the main propulsion motor.

As an added safety item, a lamp L of the marine 32-point variety can be mounted on the upper end of the trolling motor support shaft, and connected by the wires 102 and 106 to the battery A through a switch 79 also mounted on the control head box 70 as can be seen, for instance, in FIG. 2.

FIGS. 4 and 5 show a second embodiment of the invention in which the electric trolling outboard is mounted on the transom T of the boat instead of mounting it on the main propulsion outboard as shown in FIG. 1. For this purpose, a divided outboard mounting bracket is provided which also comprises the frame 110 of the trolling outboard, and includes an articulated bracket member 112 which is screwed to the transom of the boat. A bolt and wing nut 114 is used to clamp the frame and bracket 110 and 112 together, and their overlaps preferably include striations suitable to increase the frictional grip. By loosening the wing nut 114 the motor may be tilted to a position in which its shaft 116 is vertical. The shaft 116 supports a submersible lower unit 118 which also includes a housing 120 having a motor therein which drives a propeller 122, and includes an eyelet 124. Shaft 116 extends through a bearing 126 which is welded to the frame 110 and which supports the shaft 116 against tilting, while at the same time permitting the shaft to be either reciprocated in the bearing 126 or rotated therein for steering.

The circular motor suspending shaft 116 can be raised or lowered in the bearing 126 by reeling the cable 128 in or out using the electric winch which comprises a cable winding drum 130 driven by a small electric motor 131. The cable 128 passes over a pulley 132 secured to the frame 110, whereby when the motor 131 is operated to rotate the drum 130, cable 128 is wound in or out and raises or lowers the submersible lower unit 118 whose weight is suspended on the cable 128 and the eyelet 124.

The shaft 116 carries upper and lower abutments 134 and 135 which are also adjustably secured on the shaft 116 by the friction collars 136 and 137. In the embodiment shown in FIG. 5, the limit switches 80 and 90 are given the same reference numerals as they have in FIGS. 2 and 3 since the switches are the same and perform the same functions. These switches are mounted on plates 140 and 141 which extend outwardly from the bearing 126.

The electric trolling motor is steered by a conventional arm 142 which is secured to the shaft 116 at a

collar 143 and the outer end of the arm 142 is connected by a linkage 144 to the steering arm 12 of the outboard 10, both of the connecting joints 145 and 146 being universal joints, whereby the raising and the lowering of the shaft 116 will not bind the steering of the main motor when the steering cables C pulls its arms back and forth to various positions. The abutments 134 and 135 operate the limit switches 80 and 90 in the same manner as has previously been explained in connection with FIG. 3, which incidentally applies to the embodiment shown in FIGS. 4 and 5 as well as to the embodiment shown in FIGS. 1 and 2. The main propulsion outboard is prevented from running whenever the abutment 135 opens the two pole switch 80 because the trolling motor unit 118 is immersed, and the abutment 134 also operates to open the switch 90 with regard to both of its poles whenever the trolling motor is in the fully raised position, thereby preventing operation of its motor out of water. In either of the embodiments shown in FIG. 1 or in FIG. 4, the motor raising and lowering cable 64 in FIG. 1 and 128 in FIG. 4 can be extended and guided by pulleys to go directly to the wheel station rather than to the winch in the outboard mounting bracket to provide a less expensive model which is still relatively convenient to control manually from a remote position in the boat.

This invention is not to be limited to the exact forms shown in the drawings, for obviously changes may be made therein within scope of the following claims.

I claim:

1. An improved propulsion means for mounting on the transom of a boat, comprising:

- a. a main outboard motor pivotally mounted on said transom and operative for driving and steering the boat at cruising speeds;
- b. an electric outboard motor for driving the boat at trolling speeds;
- c. means connecting the outboard motor to the main outboard motor so that the former steers in unison with the latter;
- d. a mounting assembly for supporting the electric outboard motor including a shaft extending upwardly from the electric motor, a fixed supporting frame receiving said shaft above the motor and supporting it in vertically reciprocable relationship to the frame, and means for raising and lowering the shaft so that the electric motor will selectively occupy an up position with the motor out of the water and a down position with the motor in the water; and
- e. limit switches on the frame and including an up limit switch connected to disable the electric motor and a down limit switch connected to disable the main outboard motor.

2. In propulsion means as set forth in claim 1, said means for raising and lowering the electric outboard motor comprising an electric winch mounted in said frame and coupled to raise and lower the shaft and outboard motor, a reversible winch control switch circuitry, and circuitry connecting the reversible switch and the limit switches such that the up switch disables the control switch circuitry from raising the shaft beyond the up position and the down switch disables the control circuitry from lowering the shaft beyond the down position.

3. In propulsion means as set forth in claim 1, wherein said boat includes a source of power, a control

head box coupled through flexible cables to said source and to said electric outboard motor, and said control head box including said reversible winch control switch circuitry, electric outboard motor speed control means and electric outboard motor reversing switch means.

4. In propulsion means as set forth in claim 1, said connecting means comprising mounting bracket means connected at one end to said supporting frame and connected at the other end to said main outboard motor to support the frame in fixed relation to the main outboard motor, said shaft being non-circular in cross-section and said supporting frame supporting it non-rotationally.

5. In propulsion means as set forth in claim 1, said supporting frame being fixed to said transom adjacent to the main outboard motor and including means for rotationally supporting said shaft, a steering arm extending outwardly from said shaft; and linkage means connecting said arm with said main outboard motor so that when the latter is turned about its pivotal mounting for steering, said shaft will rotate in unison with it.

6. In propulsion means as set forth in claim 1, said up and down limit switches being supported on said frame and said shaft carrying switch actuating abutments clamped on the shaft above and below said switches and adjustable along the length of the shaft.

7. An electric outboard trolling motor assembly comprising:

- a. a submersible electric motor and propeller unit;
- b. a supporting shaft extending upwardly from the submersible unit;
- c. a supporting frame;
- d. bearing means in the frame with the shaft passing through it and vertically reciprocable therein to position the submersible unit selectively in an idle up position or in a down position with the unit submerged;
- e. electric winch means in the frame and coupled to raise and lower the unit into said positions; and
- f. up and down limit switches carried by said frame and operatively located with respect to switch actuating abutments adjustably clamped on said shaft, the limit switches disabling the winch means to prevent further raising of the unit when an abutment means actuates the up limit switch and to prevent further lowering of the unit when an abutment means actuates the down limit switch.

8. The electric outboard trolling motor assembly as set forth in claim 7, wherein the trolling motor in said unit is connected with the up limit switch such that when the latter is actuated by an abutment in the up position of the unit the trolling motor is disabled.

9. The electric outboard trolling motor assembly as set forth in claim 7, wherein said supporting shaft has flat longitudinal surfaces and wherein said bearing means in the frame has roller bearings disposed to engage said flat surfaces and support the shaft reciprocally and non-rotationally.

10. The electric outboard trolling motor assembly as set forth in claim 7, including a source of power, a control head box coupled through flexible cables with said source and to said submersible motor and to said electric winch means, and said control head box including winch reversing switch circuitry, submersible motor speed control means, and submersible motor reversing switch means.

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