United States Patent [19]

Meyer

[11] **3,922,996**

[45] **Dec. 2, 1975**

[54] **STEERING APPARATUS FOR OUTBOARD MOTORS**

[75] Inventor: **James A. Meyer,** Oshkosh, Wis.

[73] Assignee: **Brunswick Corporation,** Skokie, Ill.

[22] Filed: **Aug. 29, 1974**

[21] Appl. No.: **501,498**

[52] **U.S. Cl.** ..... **115/18 R;** 74/480 B; 74/506; 123/198 DC

[51] **Int. Cl.²** **B63H 21/26;** G05G 11/00; G05G 1/08; F02B 77/00

[58] **Field of Search** ..... 115/17, 18; 74/480 B, 506, 74/504; 123/198 DC; 254/150 R

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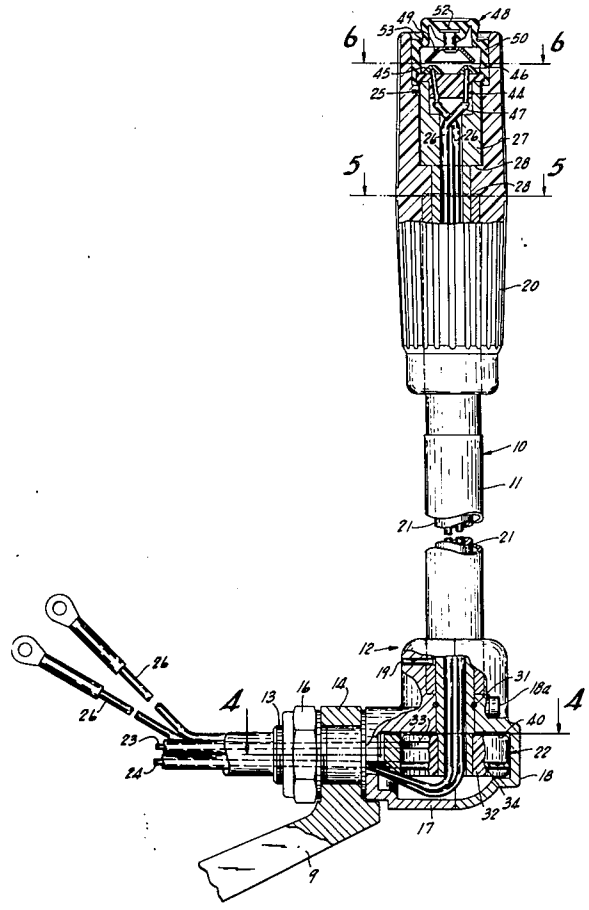
Primary Examiner—Trygve M. Blix
Assistant Examiner—Sherman D. Basinger
Attorney, Agent, or Firm—Andrus, Sceales, Starke & Sawall

[57] **ABSTRACT**

A steering handle assembly for an outboard motor includes a tiller handle having an outer throttle grip with a "kill" switch mounted within the end of the grip. A tubular housing is secured at the inner end to a rotating elbow support to place the tiller in a raised transport position and an extended steering position. A throttle shaft is rotatably mounted within the housing and fixed to the housing. The throttle shaft projects from the opposite end of the housing with an outer enlarged switch receptacle. A tubular twist grip is secured to the shaft with an inwardly projecting portion clamped between the housing and the receptacle. A throttle cable drum is secured to the inner end of the shaft with throttle cables oppositely wrapped around the drum and extended outwardly from the mounting shaft to a throttle control. Leads are threaded through the elbow and the throttle shaft to a contact support secured to the outer end of the shaft and within the twist grip. A pair of spaced pyramidal terminals are connected respectively one each to each of the leads. A conical bridging contact is mounted within a boot actuator secured in the open end of the twist grip such that axially pushing inwardly moves the bridging contact into engagement with the terminals. The leads may be connected to ground an alternator output and prevent operation of a capacitor ignition system.

14 Claims, 7 Drawing Figures



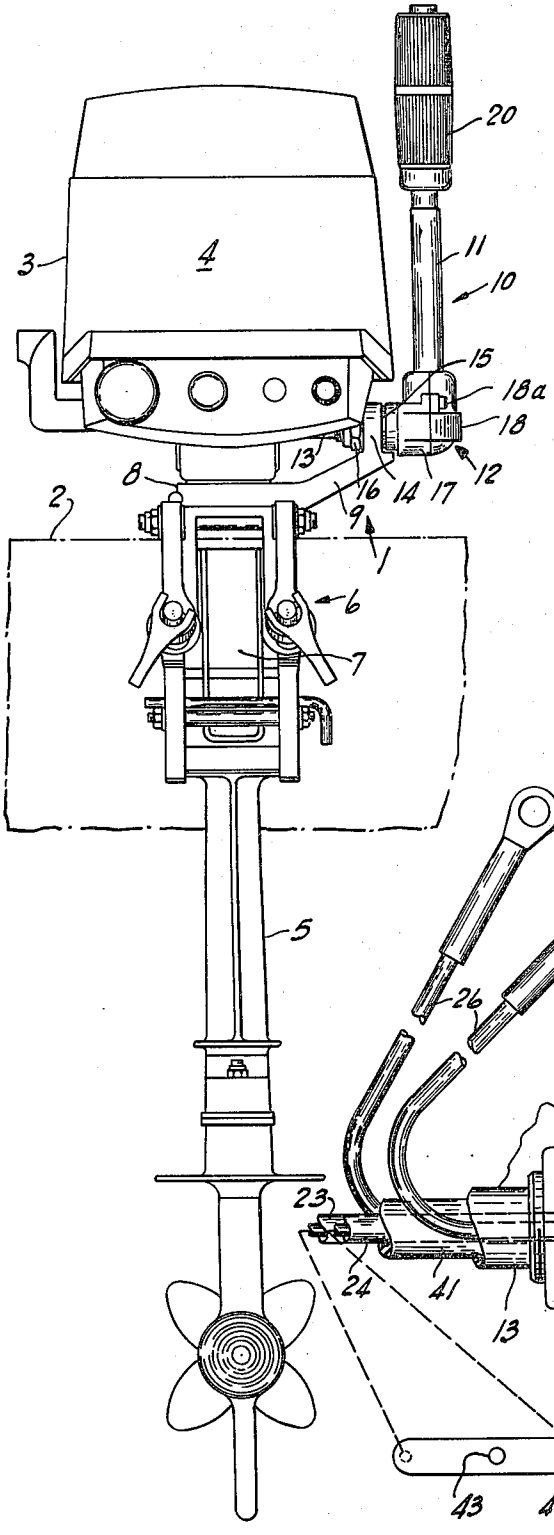


Fig. 1

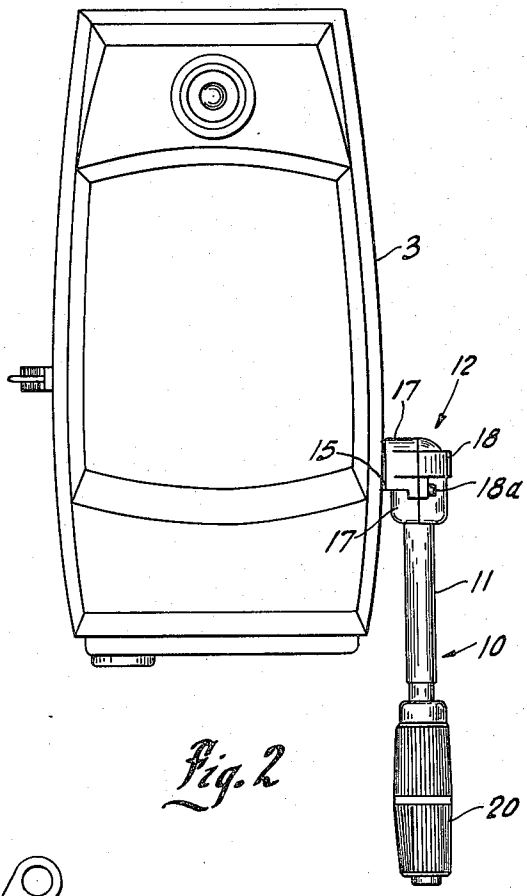


Fig. 2

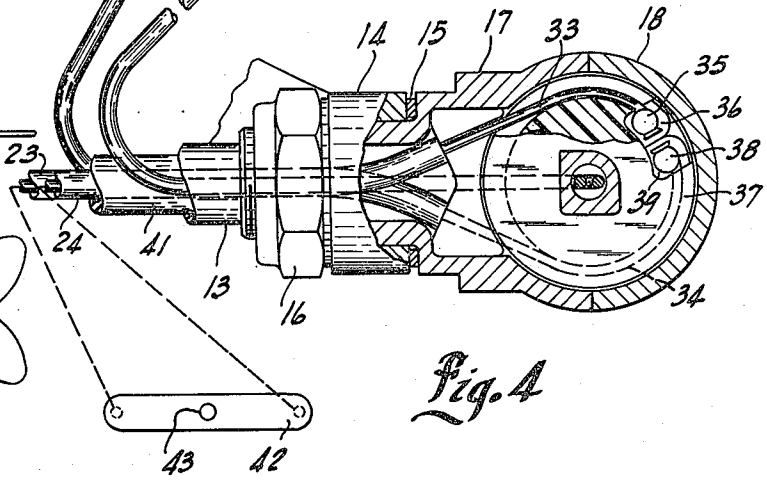


Fig. 4

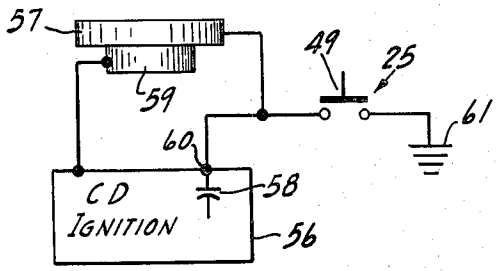


Fig. 7

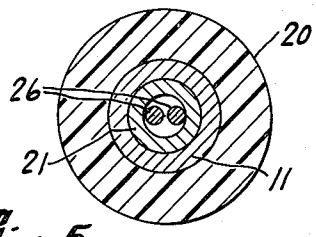


Fig. 5

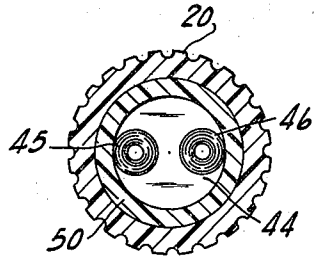


Fig. 6

Fig. 3

STEERING APPARATUS FOR OUTBOARD MOTORS

BACKGROUND OF THE INVENTION

The present invention relates to a steering apparatus for outboard motors and particularly a tiller handle type steering apparatus.

Outboard motors are mounted to the transom of a boat by a swivel bracket assembly to permit pivoting of the outboard motor about a vertical steering axis. The lower horsepower outboard motors generally employ a steering handle assembly connected directly to the outboard motor for manual rotation of the outboard for steering purposes. A suitable friction co-pilot assembly may be provided to hold the motor in any selected angularly oriented position. Conventionally, the steering handle assembly is a tiller handle pivotally coupled to the engine and provided with an outermost twist grip. An internal mechanical linkage connects thr grip to a throttle control mechanism. This permits a convenient steering and acceleration control by hand grip control assembly. In small outboard motors and the like, a kill switch is conventionally mounted as a part of the upper power head assembly to permit convenient rapid stopping of the engine. In tiller handle system, the operator may not be conveniently located to engage the kill switch because of steering requirements and attention.

SUMMARY OF THE PRESENT INVENTION

The present invention is directed to a steering handle assembly for outboard motors and particularly to an improved steering handle assembly having an interconnected "kill" switch means directly mounted within the twist grip portion of a tiller handle and connected into the circuit to terminate motor operation through the steering handle assembly. The handle further includes a simple mechanical assembly with an inner throttle control member which is rotatably mounted and coupled to the throttle control cables for engine throttle control. The present invention has been found to provide reliable steering control assembly for convenient steering and operating control of the outboard motor.

In accordance with a particularly novel construction of the present invention, the steering assembly includes a supporting tubular housing secured at the inner end to a rotating elbow support for convenient positioning of the assembly between a raised compact transport position and downwardly rotated and outward extended position for convenient steering. A throttle shaft is rotatably mounted within supporting tube and releasably coupled thereto at the inner end. The outer end of the throttle shaft projects from the tubular housing.

A twist grip is secured to the outer end of the shaft and in particular is formed of a rubber-like material with an inward projection means clamped between the outermost end of the housing and an enlarged shoulder portion on the outer end of the throttle shaft. The inner end of the shaft is provided with a cable drum having a pair of groove portions for individually receiving a pair of throttle control cables. The cables respectively wrap around the drum with one cable being wound on the drum simultaneously with the unwinding of the other cable to thereby permit the extension of the outer ends of the cables which are connected to the opposite ends of a pivotal support throttle member for pivoting and positioning thereof to thereby control the engine's speed.

In accordance with a particularly unique feature of this invention, interlock leads are threaded through the elbow and through the throttle shaft. A contact support is secured to the outer end of the shaft with an open-ended twist grip and includes a pair of spaced terminals connected respectively one each to each of the leads. The terminals are located facing outwardly of the open end of the twist grip.

A "kill" bridging contact is coupled to a push button actuator secured in the open end of the twist grip. The actuator preferably includes a rubber-like push button boot having an annular wall secured within the grip and an outer flexible base wall. The contact is secured to the base wall in overlying, outwardly spaced relation to the terminals. The operator can merely push inwardly on the push button actuator to move the bridging contact into engagement with the terminals with the connection of the two leads disabling the electrical system.

Thus, in a preferred construction, the outboard motor employs a capacitor discharge ignition system driven from an alternator or similar power supply. The kill switch is conveniently connected between the output of the alternator and ground to directly ground the stator output and thereby positively preventing supplying power to the ignition system.

The "kill" terminals are preferably similar pyramid-shaped contacts with the apex located outwardly. The bridging contact is generally a frusto-conically shaped contact adapted to telescope downwardly over the terminals with the inward movement tending to deflect the side walls of the cone-shaped contact outwardly to thereby rapidly establish good electrical sliding engagement between the bridging contact and the terminals.

The present invention has been found to provide a mechanically reliable steering handle assembly permitting the convenient control of the throttle and engine operation by the operator.

BRIEF DESCRIPTION OF THE DRAWINGS which

The drawings furnished herewith illustrate a preferred construction of the present invention in whic the above advantages and features are clearly disclosed as well as others which will be readily understood from the following description of the illustrated embodiment.

In the drawings:

FIG. 1 is a front elevational view of an outboard motor incorporating a steering handle assembly constructed in accordance with the present invention;

FIG. 2 is a plan view of FIG. 1;

FIG. 3 is an enlarged vertical section of the steering handle assembly with parts broken away to more clearly illustrate the details of construction;

FIG. 4 is a horizontal section taken on line 4—4 of FIG. 3;

FIG. 5 is a horizontal section taken on line 5—5 of FIG. 3;

FIG. 6 is a horizontal section taken on line 6—6 of FIG. 3;

FIG. 7 is a simplified schematic illustration of a capacitor discharge ignition system.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring to the drawing and particularly to FIG. 1, an outboard motor 1 is secured to the transom of a boat

2. The outboard motor 1 generally includes an upper powerhead 3 within which an internal combustion engine 4 is located. The powerhead 3 is secured to the upper end of a drive shaft housing 5. A swivel bracket assembly 6 is attached to the boat transom 2 and coupled to the upper end of the drive shaft housing 5 immediately beneath the powerhead 3. The swivel bracket assembly 6 includes a suitable encircling pivot support assembly 7 to pivotally support the outboard motor 1 for rotation about a vertical axis. The pivot support assembly 7 may be of any suitable construction and is preferably constructed in accordance with the applicant's co-pending application entitled "Steering Apparatus for Small Outboard Motors" filed Aug. 29, 1974, bearing Ser. No. 501,486 and assigned to the same assignee as the present application. As more fully disclosed therein, the assembly 7 includes a steering bracket unit 8 coupled to the outboard drive shaft housing 5 through a suitable vibration isolation means which provides for pivoting of the driveshaft housing 5 and interconnected motor components about the axis of the housing. A steering arm 9 extends laterally outwardly from bracket unit 8 beneath the powerhead 3. A tiller or steering handle assembly 10 is pviotally secured to arm 9 for selective positioning in an upright position for storage and alternately to a downwardly and outwardly extended position for steering. Thus, with the handle assembly 10 projecting outwardly, the operator can readily grasp the outer end thereof and by turning in a horizontal plane, pivot the motor 1 for steering purposes.

The present invention is particularly directed to the steering handle assembly 10 construction. Consequently, no further description of the outer outboard motor components is given other than as required to fully describe the illustrated embodiment of the present invention.

Generally, the steering handle assembly 10 includes a tubular housing 11 pivotally secured by a 90° pivot elbow 12 to the arm 9. The elbow 12 includes a tubular shaft portion or leg 13 projecting through a hub 14 on the outermost end of the arm 9. The outer end of leg 13 is threaded. Suitable bearing washers 15 are located on the leg 13 to the opposite sides of the hub 14 and a clamping nut 16 is threaded onto the outer threaded end of the leg 13 to pivotally clamp the elbow 12 to the arm 9. The opposite leg of the elbow is split longitudinally and includes a base 17 and a removable, outer cap 18 which is releasably secured to the base by suitable cap screws 18*a*.

The housing 11 is clamped within the leg 17–18 of the elbow 12 with a dowl pin 19 projecting from the elbow into the tube 11 to positively hold the housing 11 from axial or rotational movement. Housing 11 thus provides a protective housing extending outwardly from the elbow 12 and terminating at the outer end in supporting relation within a twist grip 20.

Generally, in the illustrated embodiment of the invention, a throttle shaft 21 projects completely through the housing 11 and is coupled at the outer end to grip 20. A throttle control unit 22 is coupled to the innermost end of the shaft 21 and is positioned in accordance with the turning of grip 20. The control unit 22 includes a pair of push-pull cables 23 and 24 which extend outwardly through leg 13 for connection to an engine throttle control of the motor. In the present invention, a switch assembly 25 is housed within the outer end of the shaft 21 and the twist grip 20. Leads 26 extend downwardly through the shaft 21 from the switch assembly or unit 25 and exit therefrom through the elbow 12 and particular leg with cables 23 and 24 for connection into the electrical system of the outboard motor, as hereinafter described.

More particularly, the outer end of shaft 21 has an enlarged outer switch receptacle 27 spaced from the outer end of housing 11 and with an outer diameter generally similar to or slightly larger than the outer diameter of the housing 11. The spacing of receptacle 27 from housing 11 defines a gap 28 for the twist grip 20. The grip 20 is a suitable molded rubber or the like which includes an inner annular clamping projection 29 located within the gap 28. Further, the outer surface of receptacle 27 is provided with a knurled outer surface to firmly interconnect the twist grip 20 to the shaft 21 as at 30.

The inner end of the shaft 21 projects through the split leg of the elbow 13 and is secured therein by a small clip ring 31. With the cap 18 attached to the base 17, the shaft 21 is firmly locked to the elbow 12 including the twist grip 20 with the projection 29 rotatably clamped between the housing 11 and the receptacle 27.

The molded grip 20 extends over the outer end of the housing 11 which is slightly reduced to form a supporting bearing surface extending throughout essentially one-half the length of the grip 20 to provide a firm, reliable rotating support of the grip and the interconnected outer end of the shaft 21. Rotation of the twist grip 20 is transmitted by the shaft 21 to the throttle control unit 22.

In the illustrated embodiment of the invention, the throttle control unit 22 includes a drum 32 press fitted or otherwise fixed to the innermost end of the shaft 21 within the split leg of elbow 12. The drum 32 rotates normal to the shaft axis and is provided with a pair of oppositely extended grooves 33 and 34 to receive and accommodate the throttle control wire or cables 23 and 24 which are oppositely wrapped about the drum. As viewed in FIG. 3, wire 23 is wrapped in a clockwise direction partially about the drum within the groove 33. The end of the wire 23 is provided with an interlock enlargement or ball 35 which fits in an enlarged recess 36 in the inner end face 37 of the drum 32.

The wire or cable 24 is wrapped in the opposite or counterclockwise direction partially about the opposite side of the drum and in the axially spaced groove 34. Cable 24 terminates in a similar enlarged coupling ball 38 located within a recess 39 extending inwardly from the same inner face of the drum as recess 36. The diameter of the drum 32 closely approximates the inner diameter of the split leg of the elbow to securely retain the wires within the grooves. The inner recessed face 37 of the drum is located immediately adjacent an inner wall 40 of the elbow 12 to securely lock the coupling balls in place. The rotation of the handle shaft 21 and the interconnected drum 32 results in the pulling inwardly of the one cable while simultaneously causing the opposite cable to move outwardly through the elbow leg 13. The cables form part of the well known push-pull type cable units having an outer flexible sheath 41. As diagrammatically shown in FIG. 2, the outer ends of wires 23 and 24 are connected to a speed control or throttle lever 42 such as more fully disclosed in the application of James H. Frahm entitled "Throttle and Ignition Advance Linkage for an Internal Combus-

tion Engine" bearing Ser. No. 501,656, filed on Aug. 29, 1974 and assigned to the same assignee as the present application. Generally, lever 42 is centrally pivoted as at 43 and the wires 23 and 24 are connected respectively to the opposite ends. The pulling of one cable associated with a first rotation of drum 32 causes rotation of the lever 42 in a first direction, while an opposite rotation of the drum 32 releases the latter cable. The opposite cable pulls on the opposite end of the lever with a resulting opposite rotation. As any suitable throttle lever control can be adapted to the pivotal control by the cables, no further description thereof is given.

In small, manually started outboard motors, the special switch unit 25 is desirably connected to rapidly terminate motor operation, when desired. In accordance with the present invention, the switch unit 25 is connected by the leads 26 to selectively terminate motor operation. In the illustrated embodiment of the invention, the switch unti 25 includes an insulating terminal block 44 which projects into the housing or opening defined by receptacle 27 on the outermost end of the shaft 21. The terminal block 44 supports a pair of laterally spaced terminals 45 and 46 connected respectively one each to the individual wires 26 which are crossed as at 47 within the innermost portion of the receptacle 27. The twist grip 20 extends outwardly beyond the terminal block 44 and the terminals 45 and 46 and defines a housing within which a push button operator 48 is secured. A bridging contact 49 is secured to the inner face of the push button operator 48 in spaced overlying relation to the terminals. In the illustrated embodiment of the invention, the push button operator 48 is a rubber-like member having a tubular mounting portion 50 adapted to be telescoped into the end of the twist grip 20 with a resilient clamping force. The innermost end of portion 50 includes a groove accommodating an encircling flange 51 of the terminal block 44. The outer end wall of the operator is an integrally formed boot 52 attached to portion 50 by a relatively thin flexible and resilient connection 53. The bridging contact 49 includes a mounting stem 54 secured within the center of the boot 52.

The illustrated terminals 45 and 46 are generally pyramid-shaped with the outermost surfaces providing similar inclined contact surfaces. The bridging contact 49 is a generally frusto-conically shaped member having a narrow base secured to the stem 54 and opening downwardly and outwardly in overlying relation to the terminals 45 and 46. Depressing the boot 52 forces the contact 49 to move down over the terminals 45 and 46 with the inclined walls establishing firm sliding engagement and good electrical contact. The inward movement thus directly connects the terminals 45 and 46 to each other to complete the circuit between the two leads 26.

The leads 26, as previously noted, extend downwardly through the shaft and rotate therewith, with the inner ends projecting outwardly from a twist chamber 55 formed within the elbow 12. As the shaft 21 rotates through a limited number of degrees such as 180°, the leads 24 may rotate therewith, winding and unwinding within the chamber 55.

The leads 26 extend outwardly through the shaft portion or leg 13 with the cables 23 and 24 and into the outboard motor, where the leads are connected into the ignition system to provide suitable termination of operation upon depressing of the push bottom operator 48.

As diagrammatically shown in FIG. 4, the outboard motor may conveniently be provided with a capacitor discharge ignition 56, shown in block diagram, and coupled to an alternator 57 for charging of a capacitor 58. The alternator 57 is conveniently formed with a rotor connected to the flywheel and a fixed stator assembly, not shown. A trigger coil unit 59 may also be provided as a part of the alternator to generate time spaced signals for actuating a switch means which discharges the capacitor and thereby fires the engine. In such a system, the leads 26 may conveniently be connected between the charging stator terminal 60 and ground 61. Depressing of the switch button shorts the output of the alternator directly to ground and positively prevents charging of the capacitor and thereby positively prevents operation firing of the engine.

The illustrated switches may, of course, be connected for other purposes and may be constructed as normally closed. For example, the engine may employ a magnito ignition system with the throttle grip switch operable to stop the engine. Further, a normally closed switch may be connected in the engine ignition system to stop the engine when actuated to the open position or state.

The present invention thus provides a reliable, rugged twist grip tiller handle having switch control means conveniently available for operation by the motor operator.

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. A steering handle assembly for outboard motors, comprising an angled tubular mounting means having offset leg portions joined by a common portion, one of said leg portions including a bearing means for rotatable mounting thereof, a tubular shaft means adapted to be rotatively mounted in the second of the offset leg portions of the mounting means, a throttle control having a throttle positioning means extended through said first offset leg portion and a coupler affixed to the inner end of said tubular shaft within said tubular mounting means, an outer handle grip portion secured to the shaft portion, a switch means located within said handle grip portion, leads extended through said tubular shaft and the first and second leg portions of the mounting means for connection to said motor, an operator in said grip portion for operation of said switch means.

2. The steering handle assembly of claim 1 including an outer fixed housing secured to the mounting means with the shaft means extending therethrough, said grip telescoped over the outer end of the housing, and said switch means located outwardly of the housing within the outer end of the grip portion, said operator being located in outer end of the grip portion.

3. The steering handle assembly of claim 2 wherein said mounting means is a split tubular member clamped about said housing, a stop member in said mounting means engaging said housing to prevent rotation thereof, said split tubular member projecting from said housing and enclosing said tubular shaft portion, and axial stop means on said tubular member engaging said shaft portion inwardly of said throttle control coupler

and rotatably mounting the shaft portion and to prevent axial movement of the shaft means.

4. The steering handle assembly of claim **1** wherein handle grip portion has a tubular outer end, said switch unit including a pair of laterally spaced terminals mounted within said outer end, said leads including first and second flexible conductors secured to said terminals and extended as a twisted cable pair through said tubular means, said operator being secured with the outer end in outwardly spaced relation to the terminals and including a bridging contact overlying said terminals and resiliently supported for inward movement into engagement with said terminals.

5. The steering handle apparatus of claim **4** wherein said terminals are general pyramidal in shape, and said bridging contact is inverted conically shaped members, said terminals and contact having generally correspondingly inclined walls.

6. The steering handle apparatus of claim **5** including a rubber-like boot secured within the grip and having said bridging contact secured to the center thereof.

7. The apparatus of claim **1** wherein said throttle coupler includes a rotating drum affixed to the inner end of said shaft within said common portion and with said leads passing therethrough, said drum having a pair of oppositely wound grooves on the periphery of the drum and aligned with the first of the leg portions, a first throttle control cable wound in a first direction about the drum and extended outwardly through the first leg portion, a second cable secured to the drum adjacent said first cable and wound in the opposite direction about said drum and extended outwardly through the first leg portion.

8. The apparatus of claim **1** in the combination with a capacitor discharge ignition system, an input terminal to said capacitor discharge ignition system adapted to be connected to the output of an alternator, said leads being connected to said input terminal and to ground means whereby actuation of said operator grounds the output of the alternator and thereby prevents charging of the capacitor discharge ignition system to positively prevent engine operation.

9. A steering handle assembly for outboard motors having a steering bracket with a coupling hub comprising an elbow-shaped mounting member having a tubular bearing leg adapted to be rotatively mounted within the hub of the steering bracket, said member having an offset tubular coupling leg affixed to said bearing leg, a tubular housing immovably secured to said coupling leg an extending outwardly therefrom, a tubular shaft extending through said housing and rotatably affixed within said coupling leg, a throttle coupler within said mounting member and affixed to the inner end of said tubular shaft and rotating therewith, said tubular shaft extending outwardly from the outer end of said housing, a twist grip having an inner end portion telescoped over the end of the housing and projecting co-axially outwardly therefrom past the outer end of the shaft to define an end switch chamber, means securing the grip to said shaft, a switch unit having terminal means mounted upon the outer end of said shaft within said chamber, an actuator secured in overlying, sealing relationship to the outermost end of said twist grip, said actuator being biased to an outward position and resiliently depressable to actuate said switch unit, a pair of flexible leads connected to said switch unit and extending downwardly through said grip and tubular shaft and exiting from the innermost end of such shaft, said leads being bent within the mounting member and extending outwardly through the tubular portion for selective connection to the outboard motor electrical system.

10. The handle assembly of claim **9** wherein said throttle unit includes a rotating drum affixed to the inner end of said shaft, said drum having a pair of oppositely wound grooves on the periphery of the drum, a first throttle control cable wound in a first direction about the drum, a second cable secured to the drum adjacent said first cable and wound in the opposite direction about said drum, said cables projecting outwardly through said bearing leg of the mounting member for connection to the throttle control of the outboard motor.

11. The handle assembly of claim **9** in the combination with a capacitor discharge ignition system, an input terminal to said capacitor discharge ignition system adapted to be connected to the output of an alternator, said leads being connected to said input terminal and to ground means whereby actuation of said actuator grounds the output of the alternator and thereby pfevents charging of the capacitor discharge ignition system to positively prevent engine operation.

12. A steering handle assembly for outboard motors having a steering bracket with a coupling hub comprising a mounting member having a tubular portion adapted to be rotatively mounted within the hub of the steering bracket, said member having an offset coupling leg, a tubular housing immovably secured to said leg and extending outwardly therefrom, a tubular shaft extending through said housing and rotatably affixed within said coupling leg, a throttle coupler affixed to the inner end of said tubular shaft and rotating therewith, said tubular shaft extending outwardly from the outer end of said housing, a twist grip having an inner end portion telescoped over the end of the housing and projecting co-axially outwardly therefrom past the outer end of the shaft to define an end switch chamber, means securing the grip to said shaft, a switch unit mounted within said chamber, an actuator secured in overlying, sealing relationship to the outermost end of said twist grip, said actuator being biased to an outward position and resiliently depressable to actuate said switch unit, leads connected to such switch unit and extending downwardly through said grip and tubular shaft and exiting from the innermost end of such shaft and extending outwardly through the tubular portion for selective connection to the outboard motor system, said shaft having an outer end enlarged receptacle spaced from the end of said housing, said grip having an annular projection located between the housing and said receptacle, said twist grip being axially retained on said housing by said shaft for rotation with said shaft, said grip projecting outwardly of said receptacle and defining said switch chamber.

13. A steering handle assembly for outboard motors having a steering bracket with a coupling hub comprising a mounting member having a tubular portion adapted to be rotatively mounted within the hub of the steering bracket, said member having an offset coupling leg, a tubular housing immovably secured to said leg and extending outwardly therefrom, a tubular shaft extending through said housing and rotatably affixed within said coupling leg, a throttle coupler affixed to the inner end of said tubular shaft and rotating therewith, said tubular shaft extending outwardly from the

outer end of said housing, a twist grip having an inner end portion telescoped over the end of the housing and projecting co-axially outwardly therefrom past the outer end of the shaft to define an end switch chamber, means securing the grip to said shaft, a switch unit mounted within said chamber, an actuator secured in overlying, sealing relationship to the outermost end of said twist grip, said actuator being biased to an outward position and resiliently depressable to actuate said switch unit, leads connected to such switch unit and extending downwardly through said grip and tubular shaft and exiting from the innermost end of such shaft and extending outwardly through the tubular portion for selective connection to the outboard motor system, said switch unit includes an insulating block mounted within the switch chamber and the outer end of said tubular shaft, a pair of laterally spaced terminals secured to said block, said switch actuator including a rubber boot member overlying the end of said twist grip, a bridging contact secured to the inner surface of the boot and movable into bridging engagement with said terminals to establish an electrical connection between said switch leads.

14. The steering handle assembly of claim **13** wherein said terminals are pyramidal in shape and laterally spaced to define a generally conical cross-section, and said bridging contact is a conically shaped cup element having side wall with an angle corresponding to that defined by the terminals.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,922,996

DATED : DECEMBER 2, 1975

INVENTOR(S) : JAMES A. MEYER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column	1,	Line	61,	before "one" insert --- the ---;
Column	2,	Line	40,	after "DRAWINGS" cancel "which";
Column	2,	Line	42,	after "in" cancel "whic" and insert --- which ---;
Column	3,	Line	34,	before "outboard" cancel "outer" and insert --- other ---;
Column CLAIM 1	6,	Line	45,	after "shaft" insert --- means ---;
Column CLAIM 1	6,	Line	47,	after "shaft" cancel "portion" and insert --- means ---;
Column CLAIM 1	6,	Line	49,	after "shaft" insert --- means ---;
Column CLAIM 3	6,	Line	65,	after "shaft" cancel "portion" and insert --- means ---;
Column CLAIM 3	7,	Line	1,	after "shaft" cancel "portion" and insert --- means ---;
Column CLAIM 7	7,	Line	24,	after "shaft" insert --- means ---;

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,922,996

DATED : DECEMBER 2, 1975

INVENTOR(S) : JAMES A. MEYER

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, Line 67, after "shaft" cancel "portion" and insert --- means ---;
CLAIM 3

Signed and Sealed this

eighteenth Day of May 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks