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Apparatus for assisting transmission shifting in a marine propulsion device

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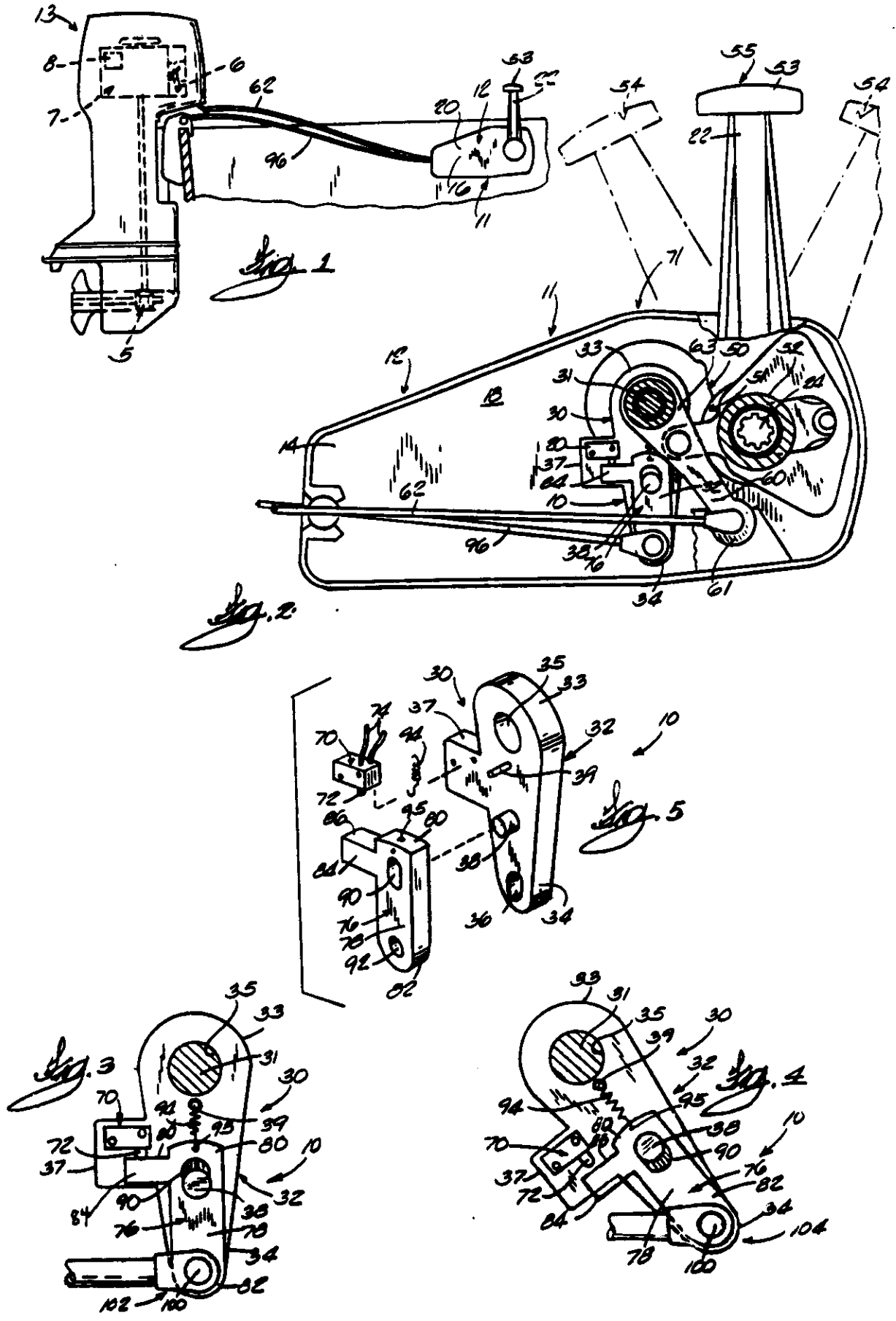
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"Apparatus for Assisting Transmission Shifting
in a Marine Propulsion Device"

This invention relates generally to apparatus for assisting shifting of a transmission in a marine propulsion device, and is concerned more particularly, but not exclusively, with single lever controls for regulating the throttle and transmission associated with a marine propulsion device such as an outboard motor or stern drive unit, which control can be manually manipulated for shifting the transmission between a neutral condition and a drive condition, and which interrupts the engine ignition in response to shifting of the transmission to thereby assist transmission shifting.

Attention is directed to the United States Patent No. 4,215,596 which issued on August 5, 1980 and which relates to a gear shift lever assembly having ignition system deenergizing means, to United States Patent No. 4,232,771 which issued on November 11, 1980 and which relates to a single lever remote control, to United States Patent No. 4,262,622 issued on April 21, 1981, to United States Patent No. 4,432,734 issued on February 21, 1984, and to United States Patent No. 4,525,149 issued on June 25, 1985, all of which relate to marine propulsion devices including ignition interruption means to assist transmission shifting.

According to one aspect of the present invention there is provided a marine propulsion device including an internal combustion engine having a throttle, an

ignition, and a transmission shiftable between a neutral and a drive condition, a control located remotely from said engine and including means connected to said throttle for controlling engine speed and connected to said
5 transmission for shifting of said transmission between the neutral condition and the drive condition, said control being a single lever control mounted on a boat and including a housing, a shaft member supported within said housing for rotation relative to said housing, a control
10 lever connected to said shaft member for common rotation therewith relative to a neutral position, a shift lever mounted on said housing and connected with said control lever for movement between a neutral position and a drive position and operable to control shifting of said
15 transmission between the neutral condition and the drive condition in response to rotational movement of said control lever from the neutral position, and means on said control and operably connected to said ignition for interrupting engine ignition in response to shifting of
20 said transmission from the drive condition to the neutral condition.

According to another aspect of the present invention there is provided a single lever control for a marine propulsion device including an internal combustion
25 engine having a throttle, an ignition, and a transmission shiftable between a neutral and a drive condition, said single lever control being adapted to be located remotely from said marine propulsion device and including a

housing, a shaft member supported within said housing for rotation relative to said housing, a control lever connected to said shaft member for common rotation therewith relative to a neutral position, an engine speed
5 control member mounted on said housing and connected with said control lever for movement between a low speed position and a high speed position and connected to said engine throttle for controlling engine speed in response to rotational movement of the control lever from the
10 neutral position, a shift lever mounted on said housing and connected with said control lever for movement between a neutral position and a drive position and connected to said transmission for operably shifting said transmission between the neutral condition and the drive condition in
15 response to rotational movement of said control lever from the neutral position, and means on said single lever control and operably connected to said ignition for interrupting engine ignition in response to movement of said control lever relative to the neutral position.

20 The invention also provides an apparatus for assisting shifting of a transmission in a marine propulsion device having an internal combustion engine including a throttle, and an ignition system, which transmission is shiftable between a neutral condition and
25 a drive condition, said apparatus comprising a control device adapted to be mounted remotely from said marine propulsion device and including an engine speed control member connected to said throttle to control engine speed

and a shift lever movable between a neutral position and a drive position and operably connected with said transmission for shifting said transmission between the drive condition and the neutral condition in response to
5 shift lever movement between the neutral position and the drive position, means on said shift lever and connected with said ignition system for interrupting operation of said ignition system, and means movably mounted on said shift lever for actuating said interrupting means in
10 response to movement of said shift lever relative to the neutral position.

The invention further provides a marine propulsion device including an internal combustion engine including an ignition system, a transmission drivingly
15 connected to said internal combustion engine and shiftable between a drive condition and a neutral condition, a shift lever adapted to be mounted on a boat for pivotal movement relative thereto and operably connected with said transmission for shifting said transmission between the
20 drive condition and the neutral condition, a switch fixed on said shift lever for interrupting the operation of said ignition system in response to movement of said shift lever from a drive position to a neutral position, an actuator mounted on said shift lever for movement of said
25 shift lever from a drive position to a neutral position, an actuator mounted on said shift lever for movement relative to said switch in response to movement of said shift lever from the drive position to the neutral

position, and means mounted on said shift lever for releasably holding said actuator against movement relative to said switch in response to movement of said shift lever from the neutral position to the drive position.

5 In order that the invention may be more fully understood, reference will now be made, by way of example, to the accompanying drawings, in which:

 Figure 1 is a partial side elevational view of a boat mounted marine propulsion device incorporating
10 various features of the invention.

 Figure 2 is a somewhat enlarged fragmentary, longitudinal, vertical sectional view of a single lever control incorporating various features of the present invention taken from a position along line 2-2 of Figure
15 1.

6.

Figure 3 is a somewhat enlarged, fragmentary, side elevation view of a portion of the marine propulsion device of Figure 2 shown in a first position.

Figure 4 is a somewhat enlarged, fragmentary, side elevation view of a portion of the marine propulsion device of Figure 2 shown in a second position.

Figure 5 is a somewhat enlarged, fragmentary, exploded perspective view of a portion of the marine propulsion device shown in Figure 2.

Before one embodiment of the invention is explained in detail, it is to be understood that the invention is not limited in its application to the details of the construction and arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for purposes of description and should not be regarded as limiting.

DESCRIPTION OF A PREFERRED EMBODIMENT

The apparatus for assisting transmission shifting in a marine propulsion device is generally indicated by the numeral 10 in Figure 2. Shown in the drawings is a single lever control 11 for operating a transmission 5 and throttle 6 of a remotely located marine propulsion device such as an outboard motor 13. Similarly this device could be utilized in connection with a stern drive unit (not shown). The outboard motor 13 includes an internal combustion engine 7, a

transmission 5, and an ignition system 8. The single lever control 11 includes (see Figure 2) a housing 12 comprised of opposed cover halves or sections 14 and 16, respectively, which include respective side walls 18 and 20 and which are suitably fastened together to form the generally closed housing 12.

The single lever control 11 also includes a main control lever 22 extending exteriorly of the housing 12 for both pivotal or rotational movement and lateral or axial movement relative to the housing 12. Provided in part for this purpose (see Figure 2) is a shaft member 24 having outer ends which are journaled in bearings (not shown). The shaft member 24 is suitably connected to the lower end of the main control lever 22 for both rotation and common lateral or axial movement therewith.

Clutch or transmission control is provided by (see Figures 2, 3 and 4) a shift arm or lever 30 which is pivotally mounted on a stud or boss 31 which extends from the cover section 14. The shift lever 30 has an elongated, somewhat generally frusto-triangular shaped main body 32 including first and second ends 33 and 34, respectively. An aperture 35 is located adjacent the first end 33 and the stud 31 extends therethrough. An elongated aperture 36 is located adjacent the second end 34 and is oriented substantially longitudinally or in lengthwise relation relative to the elongated main body 32 of the shift lever 30 (see Figure 5). The shift lever 30 further includes an arm member 37 which is positioned in substantially the same plane as the main body 32 and which is located between the first and second ends 33 and 34 of the main

body 32. (See Figure 3.) A post or shaft 38 is fixed on the elongated main body 32 and is positioned in substantially right angular relation therewith. The post 38 is located between the aperture 35 and the elongated aperture 36. A pin 39 is fixed on the elongated main body 32 and is located adjacent the aperture 35.

The shift lever 30 includes a gear segment 50 which meshes with a cooperating gear segment 51 provided on a shift drive member 52 which is mounted on the shaft member 24 for rotation between a neutral position and a shift position. As explained in more detail below, rotational movement of the main control lever 22 by manual manipulation of the outer end 53, from a drive position 54 (shown in phantom outline), to a neutral position 55 (shown in full lines), serves to rock the shift lever 30 about its pivotal mounting and thereby actuates the remotely located clutch or transmission appropriately. The drive position includes two drive positions which correspond to forward and rearward motion, and which are shown in phantom lines.

Throttle control is provided by (see Figure 2) a throttle arm or lever 60 which, at its lower end 61, is adapted for connection to a push-pull cable 62 which is operatively connected to a remotely located engine throttle 6. The upper end of the throttle member is mounted for pivotal movement about an axis fixed relative to the housing 12 such as on a stud or boss (not shown) extending from the cover section 16 coaxially with the stud 31 on the cover 14. The operation of the throttle control is set forth in United States Prince

Patent No. 4,232,771, and therefore is not discussed in further detail herein.

Means are provided on the shift lever 30 and connected with the ignition system for interrupting the operation of the ignition system in response to movement of the shift lever from a drive position to a neutral position. While various arrangements can be used, in the specific construction illustrated, such means includes (see Figures 2 and 3) a normally closed switch 70 including a moveable contact 72. A pair of wires 74 operably connect the normally closed switch with the transmission which is located remotely on the outboard motor 13.

Means are provided on the shifting lever 30 for actuating the interruption means in response to movement of the shift lever from the drive position to the neutral position. While various arrangements can be used, in the specific construction illustrated, such means includes (see Figure 2) a movably mounted actuator 76 having an elongated main body 78 with first and second ends 80 and 82, respectively. The elongated main body 78 further includes an arm member 84 which is disposed in substantially the same plane as the elongated main body 78, which is positioned adjacent to the first end 80, and which is further located adjacent to the normally closed switch 70. The arm member 84 has a upper edge 86 which is adapted to operably engage the moveable contact 72 of the normally closed switch 70. The elongated main body 78 further includes an elongated aperture 90 which is located on the first end 80, which is oriented substantially longitudinally, or in

lengthwise relation relative to the main body 78 of the actuator, and which receives the post 38. The actuator 76 further includes an aperture 92 located on the second end 82 of the actuator 76. When the apparatus 10 is assembled, the aperture 92 is disposed in substantial registry with the elongated aperture 36 which is formed in the second end 34 of the shift lever 30 (see Figure 5).

The apparatus 10 also includes means on the shift lever 30 and on the actuator 76 for holding the actuator 76 against movement relative to the normally closed switch 70. While various arrangements can be used, in the specific construction illustrated, such means (see Figure 3) includes a spring 94. One end of the spring is connected to the pin 39 on the shift lever 30 and the opposite end of the spring is connected to the first end 80 of the actuator 76 by engaging a small aperture 95.

The apparatus 10 also includes means mounted on an attachment pin 100 for moving an actuator 76 out of operative contact with the normally closed switch 70 when the shift lever 30 is moved from the drive position 54 to the neutral position 55. While various arrangements can be used, in the specific construction illustrated, such means includes a shift cable 96 which has opposite ends, and which operatively connects the shift lever 30 with the transmission 5. One end of the shift cable 96 is pivotally mounted on the second end 34 of the shift lever 30 by the attachment pin 100 which extends through the elongated aperture 36 formed in the second end 34 of the shift

lever 30 and through the aperture 92 which is located on the second end 82 of the actuator 76.

In operation, the cable 96 resists movement, and in response to movement of the shift lever 30 from the neutral position 102 (see Figure 3) to the drive position 104 (see Figure 4), the spring 94 maintains the actuator 76 in a position wherein the actuator arm 84 remains in operative contact with the moveable contact 72 of the normally closed switch 70. When the actuator 76 is in this position, engine ignition is not ^{interrupted} ~~effected~~. However, the cable 96, in response to movement of the shift lever 30 from the drive position 104 (see Figure 4) to the neutral position 102 (see Figure 3), overcomes the effect of the spring 94 thereby causing lengthwise movement of actuator 76 relative to the shift lever and thereby locates the actuator arm 84 in spaced relation relative to the normally closed switch 70 (see Figure 4). When the actuator 76 is in this position, the normally closed switch opens, thus interrupting engine ignition and assisting transmission shifting. The effect of the cable is momentary and occurs only while the shift lever is moving from the drive position to the neutral position. When the shift lever assumes the neutral position, the spring 94 moves the actuator 76 and its accompanying actuator arm 84 lengthwise relative to the actuator 76 and into operative contact with the normally closed switch 76. In this position, engine ignition is not ^{interrupted} ~~effected~~, as earlier discussed.

Various of the features of the invention are set forth in the following claims.

CLAIMS

1. A marine propulsion device including an internal combustion engine having a throttle, an ignition, and a transmission shiftable between a neutral
5 and a drive condition, a control located remotely from said engine and including means connected to said throttle for controlling engine speed and connected to said transmission for shifting of said transmission between the neutral condition and the drive condition, said control
10 being a single lever control mounted on a boat and including a housing, a shaft member supported within said housing for rotation relative to said housing, a control lever connected to said shaft member for common rotation therewith relative to a neutral position, a shift lever
15 mounted on said housing and connected with said control lever for movement between a neutral position and a drive position and operable to control shifting of said transmission between the neutral condition and the drive condition in response to rotational movement of said
20 control lever from the neutral position, and means on said control and operably connected to said ignition for interrupting engine ignition in response to shifting of said transmission from the drive condition to the neutral condition.
- 25 2. A single lever control for a marine propulsion device including an internal combustion engine having a throttle, an ignition, and a transmission shiftable between a neutral and a drive condition, said single lever

control being adapted to be located remotely from said marine propulsion device and including a housing, a shaft member supported within said housing for rotation relative to said housing, a control lever connected to said shaft
5 member for common rotation therewith relative to a neutral position, an engine speed control member mounted on said housing and connected with said control lever for movement between a low speed position and a high speed position and connected to said engine throttle for controlling engine
10 speed in response to rotational movement of the control lever from the neutral position, a shift lever mounted on said housing and connected with said control lever for movement between a neutral position and a drive position and connected to said transmission for operably shifting
15 said transmission between the neutral condition and the drive condition in response to rotational movement of said control lever from the neutral position, and means on said single lever control and operably connected to said ignition for interrupting engine ignition in response to
20 movement of said control lever relative to the neutral position.

3. A single lever control in accordance with Claim 2, which further includes a stud member fixed on said housing, wherein said shift lever is adapted to be
25 pivotally mounted on said stud member, and wherein said shift lever has an elongate main body which has an outer end, and an elongate aperture located adjacent said outer end and extending substantially lengthwise of said

elongate main body.

4. A single lever control in accordance with Claim 3, wherein said means on said control for interrupting engine ignition comprises a normally closed switch which is electrically connected with said ignition system and which is adapted to be mounted on said shift lever and positioned in spaced relation relative to said elongate aperture.

5. A single lever control in accordance with Claim 4, and further including means movably mounted on said shift lever for actuating said normally closed switch in response to movement of said shift lever from the drive position to the neutral position, wherein said actuating means comprises an actuator having an elongate main body which has a first end including an elongate aperture and which has a second end including an aperture, wherein said shift lever further includes a post fixed on said shift lever and extending through said elongate aperture of said actuator, and wherein an attachment pin extends through said aperture in said second end and through said elongate aperture in said outer end of said shift lever, said attachment pin and said post permitting lengthwise movement of said actuator relative to said shift lever.

6. A single lever control in accordance with Claim 5, and further including means mounted on said shift lever for releasably holding said actuator against movement relative to said normally closed switch, said holding means comprising a spring adapted to be mounted on said

shift lever and connected to said first end of said actuator for holding said actuator in operative contact relative to said normally closed switch in response to movement of said shift lever from the neutral position to the drive position, and permitting movement of said actuator out of operative contact with said normally closed switch when said shift lever is moved from the drive position to the neutral position, and wherein said normally closed switch interrupts said engine ignition system when said actuator moves out of operative contact with said normally closed switch.

7. A single lever control in accordance with Claim 6, and further including means mounted on said attachment pin for moving said actuator out of operative contact with said normally closed switch when said shift lever is moved from the drive position to the neutral position, said moving means comprising a cable pivotally mounted on said attachment pin and connected to said transmission, and wherein said cable resists the shifting movement of said shift lever, wherein said spring maintains said actuator in operative contact with said normally closed switch when said shift lever moves from the neutral position to the drive position, and wherein said actuator moves, in response to said cable resistance, away from said normally closed switch in response to movement of said shift lever from the drive position to the neutral position.

8. An apparatus for assisting shifting of a transmission in a marine propulsion device having an

internal combustion engine including a throttle, and an ignition system, which transmission is shiftable between a neutral condition and a drive condition, said apparatus comprising a control device adapted to be mounted remotely
5 from said marine propulsion device and including an engine speed control member connected to said throttle to control engine speed and a shift lever movable between a neutral position and a drive position and operably connected with said transmission for shifting said transmission between
10 the drive condition and the neutral condition in response to shift lever movement between the neutral position and the drive position, means on said shift lever and connected with said ignition system for interrupting operation of said ignition system, and means movably
15 mounted on said shift lever for actuating said interrupting means in response to movement of said shift lever relative to the neutral position.

9. An apparatus in accordance with Claim 8, and further including a single lever control mounted on a boat
20 in a remote location relative to said internal combustion engine and including a housing fixed on the boat, a shaft member supported in said housing for rotation relative to said housing, a control lever connected to said shaft member for common rotation therewith and, including an
25 outer end manipulatable by a user and movable relative to a neutral position and a drive position, a stud member fixed on said housing, wherein said shift lever is pivotally mounted on said stud member and operably

connected with said control lever for movement between a neutral position and a drive position, and wherein said transmission is operably connected with said shift lever, said shift lever controlling shifting of said transmission
5 between the neutral condition and the drive condition in response to movement of said control lever from the neutral position to the drive position.

10. An apparatus in accordance with Claim 9, wherein said shift lever has an elongate main body including first
10 and second ends and an arm positioned between said first and second ends, and an aperture located in said first end, and wherein said stud member extends therethrough, an elongate aperture located adjacent said second end and oriented in substantially lengthwise relation relative to
15 said elongate main body, and a post fixed on said main body and positioned intermediate said first and second ends and in substantially perpendicular relation relative to said main body.

11. An apparatus in accordance with Claim 10,
20 wherein said means on said shift lever and connected with said ignition system for interrupting operation of said ignition comprises a normally closed switch mounted on said arm.

12. An apparatus in accordance with Claim 11,
25 wherein said means movably mounted on said shift lever for actuating said interrupting means comprises an actuator having an elongate main body with first and second ends and including an arm mounted adjacent said first end, an

elongate aperture located adjacent said first end and oriented substantially lengthwise relative to said main body of said actuator, and wherein said post extends through said elongate aperture, and wherein said actuator
5 further includes an aperture located adjacent said second end of said actuator, said aperture being disposed in registry with said elongate aperture formed in said second end of said shift lever, wherein said arm of said actuator is positioned adjacent said normally closed switch, and
10 wherein an attachment pin extends through said elongate aperture in said second end of said shift lever and through said aperture located in said second end of said actuator.

13. An apparatus in accordance with Claim 12, and
15 further including means on said shift lever and on said actuator for holding said actuator against movement relative to said normally closed switch, said holding means comprising a spring having a first end mounted on said shift lever and having a second end mounted on said
20 first end of said actuator.

14. An apparatus in accordance with Claim 13, and further including means mounted on said attachment pin for moving said actuator out of operative contact with said normally closed switch when said shift lever is moved from
25 the drive position to the neutral position, said moving means comprising a cable adapted to be pivotably mounted on said attachment pin and connected to said transmission and being operative, in response to movement of said shift

lever from said neutral position, to shift said transmission from said neutral condition, said cable resisting movement of said shift lever from said neutral position to said drive position and wherein said actuator
5 remains in operative contact with said normally closed switch under the influence of said spring when said shift lever moves from the neutral position to the drive position, wherein said cable, in response to movement of said shift lever from said drive position to said neutral
10 position, moves said actuator away from said normally closed switch, and wherein said normally closed switch is operative, in response to movement of said actuator away from said normally closed switch, to interrupt engine ignition.

15 15. A marine propulsion device including an internal combustion engine including an ignition system, a transmission drivingly connected to said internal combustion engine and shiftable between a drive condition and a neutral condition, a shift lever adapted to be
20 mounted on a boat for pivotal movement relative thereto and operably connected with said transmission for shifting said transmission between the drive condition and the neutral condition, a switch fixed on said shift lever for interrupting the operation of said ignition system in
25 response to movement of said shift lever from a drive position to a neutral position, an actuator mounted on said shift lever for movement of said shift lever from a drive position to a neutral position, an actuator mounted

on said shift lever for movement relative to said switch in response to movement of said shift lever from the drive position to the neutral position, and means mounted on said shift lever for releasably holding said actuator
5 against movement relative to said switch in response to movement of said shift lever from the neutral position to the drive position.

16. A marine propulsion device in accordance with Claim 15, wherein said shift lever has an elongate main
10 body including first and second ends and an arm positioned between said first and second ends, said first end of said shift lever being pivotally mounted on the boat, an elongate aperture located adjacent said second end of said shift lever and oriented lengthwise relative to said
15 elongate main body, and a post which is fixed on said main body, which is positioned intermediate said first and second ends, and which is perpendicular in relation to said main body.

17. A marine propulsion device in accordance with
20 Claim 16, wherein said switch is mounted on said arm.

18. A marine propulsion device in accordance with Claim 17, wherein said actuator has an elongate main body which has first and second ends, and which includes an arm located adjacent said first end and positioned adjacent
25 said switch, an elongate aperture located adjacent said first end of said actuator and positioned substantially lengthwise relative to said elongate main body, wherein said post extends through said elongate aperture, an

aperture located adjacent said second end of said actuator and positioned in substantial registry with said elongate aperture located on said second end of said shift lever, wherein an attachment pin extends through said elongate
5 aperture located on said second end of said shift lever and through said aperture located in said second end of said actuator, and wherein said actuator is operable, in response to movement of said shift lever from the drive position, to move from the first position wherein said arm
10 is located in operative contact with said switch to a second position wherein said arm is located in spaced relation thereto.

19. A marine propulsion device in accordance with Claim 18, wherein said means mounted on said shift lever
15 for releasably holding said actuator against movement relative to said switch comprises a spring having opposite ends respectively mounted on said first end of said actuator and said shift lever.

20. A marine propulsion device in accordance with
20 Claim 19, and further including means mounted on said attachment pin for moving said actuator out of operative contact with said switch when said shift lever is moved from the drive position to the neutral position, said moving means comprising a cable operatively connecting
25 said shift lever with said transmission, being resistant to movement, and including a first end pivotally mounted on said attachment pin and a second end operatively connected to said transmission, and wherein said cable

resists movement, and wherein said actuator, in response to movement of said shift lever from said neutral position to said drive position under the influence of said spring, remains in operative contact with said switch, and wherein
5 said cable, in response to movement of said shift lever from said drive position to said neutral position, locates said actuator arm in spaced relation relative to said switch, thereby interrupting ignition.

21. A marine propulsion device substantially as
10 hereinbefore described with reference to the accompanying drawings.

22. A single lever control substantially as hereinbefore described with reference to the accompanying drawings.

15 23. An apparatus for assisting shifting of a transmission in a marine propulsion device, substantially as hereinbefore described with reference to the accompanying drawings.

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Title APPARATUS FOR ASSISTING TRANSMISSION SHIFTING IN A MARINE PROPULSION
DEVICE

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