July 14, 1964 J. E. MINER 3,140,689

REMOTE CONTROL SYSTEM FOR OUTBOARD MOTORS

Filed June 26, 1961 2 Sheets-Sheet 1

FIG. 1.

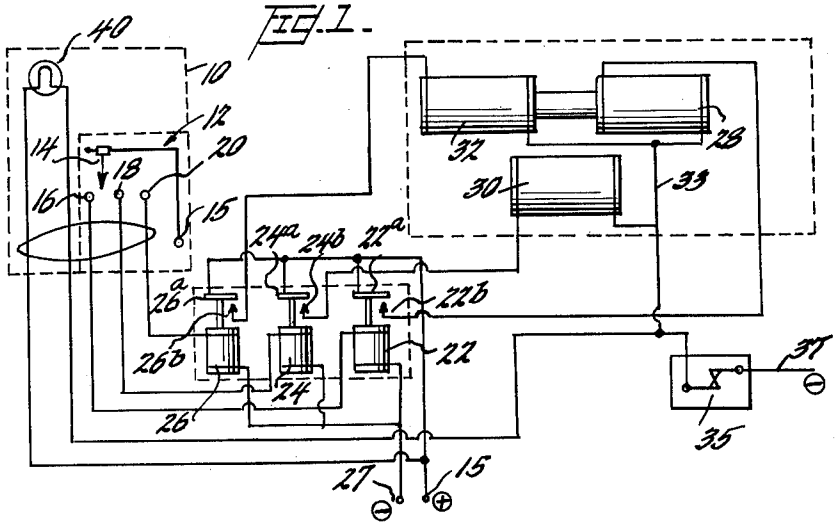
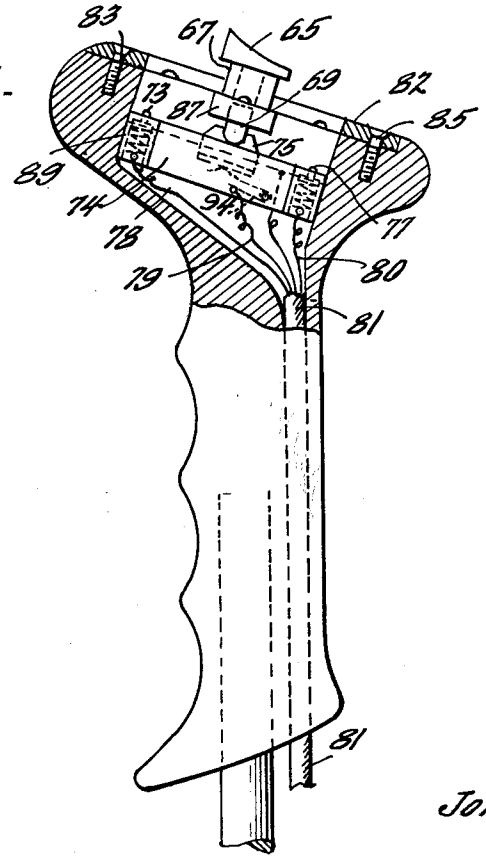


FIG. 4.



INVENTOR

John E. Miner,

BY Watson, Cole, Grindle & Watson

ATTORNEYS.

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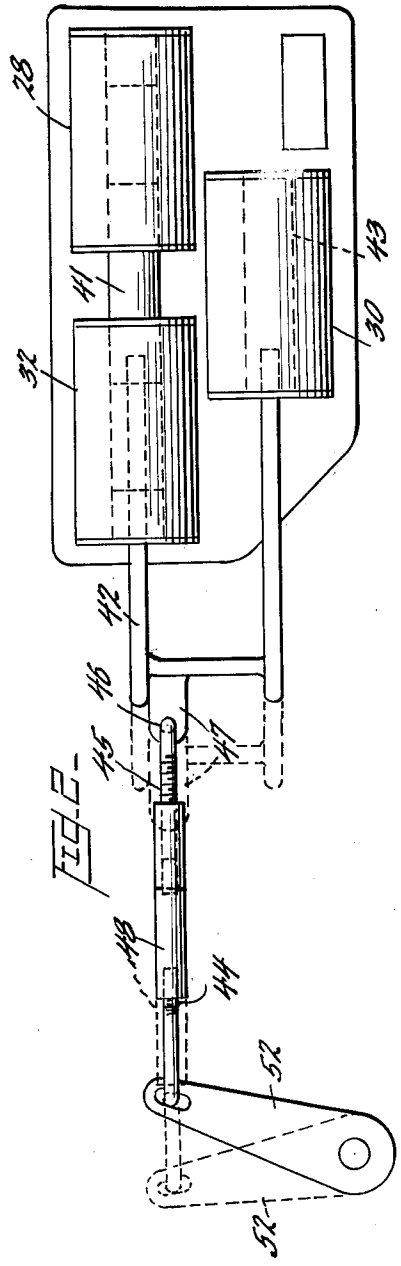


FIG. 2

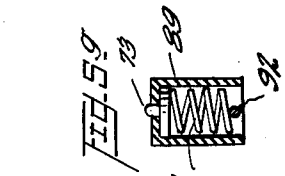


FIG. 5g

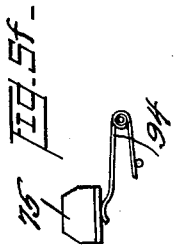


FIG. 5f

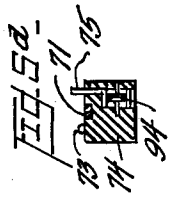


FIG. 5a

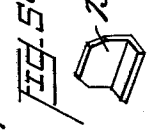


FIG. 5e

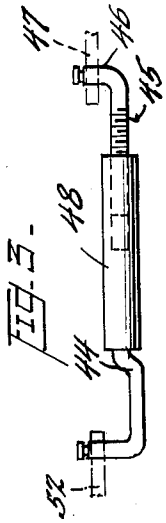


FIG. 3

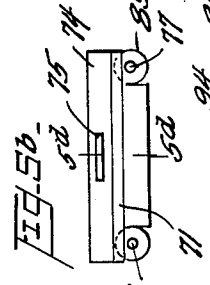


FIG. 5b

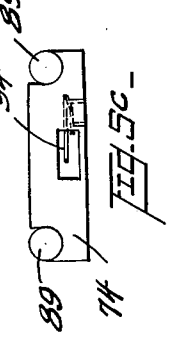


FIG. 5c

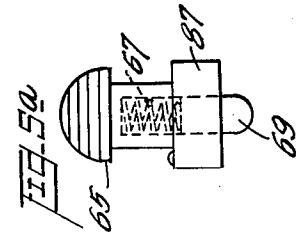


FIG. 5d

INVENTOR

John E. Miner,

BY Watson, Cole, Grindle & Watson

ATTORNEYS

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REMOTE CONTROL SYSTEM FOR OUTBOARD MOTORS

John E. Miner, 1406 2nd Ave. N., Clear Lake, Iowa

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5 Claims. (Cl. 115—17)

This invention relates to remote control mechanisms and more particularly to remote control systems for outboard powered boats suitable for control by a single lever.

Priorly, numerous attempts have been made to provide control systems with single lever remote controls for outboard motor boats. Examples of these prior art devices are shown in such patents as 2,688,298 and 2,751,799 by A. R. Long, 2,867,132 by S. E. Schroeder and 2,909,146 by C. D. Strang. In each of these prior devices, however, complex mechanical arrangements are employed, or, in the last instance, a special reversible electrical motor is required.

Accordingly, it is an object of this invention to provide an improved remote control system for shifting the gears of an outboard motor.

It is another object of this invention to provide an electrically controlled shift mechanism which is simple and economical in construction.

It is another object of this invention to provide an electrically controlled shift mechanism which can be employed with existing outboard motors, and for internal installation on future production models.

Briefly, according to aspects of this invention, the electrical control system includes a three position switch mounted on the throttle lever, which switch may be selectively moved to one of three positions to shift the gears of the outboard motor from neutral to forward, from forward to neutral, from neutral to reverse, and from reverse to neutral.

In one illustrative embodiment, the three position switch selectively energizes a "forward," a "neutral" or a "reverse" relay which, in turn, selectively completes the circuit of an associated "forward," "neutral" or "reverse" solenoid. The cores of the solenoids are mechanically linked together and this link is connected to the shift lever of the motor through an operating link. A single core is employed for both the forward and reverse solenoid and a separate core is employed for the neutral solenoid. These two cores are mounted on opposite ends of a U shaped member and the reverse and forward solenoids are positioned with their axes aligned. Advantageously, the system includes a speed responsive device which prevents energization of any of the solenoids when the speed of the motor is above a predetermined minimum value. Also advantageously, the system includes a visual indicator which indicates the proper speed for the shifting of gears, together with an optional visual indicator identifying position (forward-neutral-reverse) of unit.

The forward and reverse solenoids are spaced apart and the neutral solenoid is positioned with its midpoint opposite a point midway between the forward and reverse solenoids. With this arrangement, if the forward solenoid is energized, the reverse solenoid cannot withdraw the core of the forward solenoid for two reasons. The first of these is that it is not possible to complete the circuit of the reverse solenoid without first closing the circuit of the neutral solenoid. Second, since the core is shared between the forward and reverse solenoids and since these solenoids are spaced apart the reverse solenoid cannot attract the common core when the common core is within the forward solenoid.

These and various other objects and features of the invention will be more clearly understood from a reading of the detailed description of the invention in which:

FIGURE 1 is a schematic diagram of one illustrative embodiment of the electrical portion of the remote control system of this invention;

FIGURE 2 is a view, in elevation, partly in section, of the solenoids and the core links;

FIGURE 3 is a detail of the link of FIGURE 2;

FIGURE 4 is a view, in elevation, partly in section, of the throttle lever and selector switch, and

FIGURES 5*a* through 5*g* are details of the selector switch.

Referring now to FIGURE 1, there is depicted, in schematic form, the electrical remote control system according to one illustrative embodiment of this invention. The dotted line block 10 incloses switch 12 which is mounted on a suitable throttle lever (not shown). Switch 12 includes a sliding contact 14 which may selectively engage one of the contacts 16, 18, or 20. The sliding contact 14 is connected to one terminal such as positive terminal 15 of a battery 17. Contacts 16, 18, and 20 are the forward, neutral, and reverse contacts respectively of this control system. These contacts are connected to forward relay 22, neutral relay 24, and reverse relay 26, respectively. The opposite terminals of these relays are connected to terminal 27 of the battery 17. Each of these relays has associated therewith a pair of contacts; one of these contacts is connected to positive terminal 15 of the battery while the other of these contacts is connected to an individual solenoid. Forward relay 22 has contacts 22*a* connected to positive terminal 15 and contact 22*b* connected to one terminal of forward solenoid 28. Neutral relay 24 has a contact 24*a* connected to terminal 15 and a contact 24*b* connected to one terminal of neutral solenoid 30. Reverse relay 26 has contacts 26*a* and 26*b* which are connected to terminal 15 and reverse solenoid 32, respectively. The other terminals of each of solenoids 28, 30 and 32 are connected to a common terminal 33. A normally closed speed responsive switch 35 is connected between terminal 33 and negative battery terminal 37. Advantageously, switch 35 may be a mercury bottle type switch mounted on the throttle linkage (not shown) of the carburetor or a micro switch mounted to operate in conjunction with the ignition armature plate of the outboard motor in a manner such that the switch will open when the motor speed is above a value at which shifting can safely take place. It is, of course, understood that other forms of speed responsive switches may be employed as long as they perform the function of opening the solenoid circuits when the speed of the motor is above that speed at which shifting can safely take place.

A shift indicator lamp 40 may be mounted in any convenient place with one of its conductors connected to terminal 15 and the other of its conductors connected to terminal 33. With this arrangement, the lamp circuit will be completed whenever the speed responsive switch 35 is closed, thus the lamp will indicate that shifting may safely take place. It is, of course, understood that other forms of visual indicators, such as meters, may be employed. Three indicator lamps for indicating shift position (forward-neutral-reverse) are optional.

It is to be noted that solenoids 28 and 32 are aligned. The details of these solenoids are best seen in FIGURE 2 which shows a view, in elevation, partly in section, of one illustrative arrangement of these solenoids. Solenoids 28 and 32 are spaced apart with their axes coincident and share a common core 41 mounted on U shaped member 42. Mounted on the opposite end of U shaped member 42 is a core 43 which slides within solenoid 30. It is to be noted that if the core 41 is within neutral solenoid 28, then core 41 cannot be attracted by solenoid 32 because of the spacing between cores 28 and 32. The only core which can be moved when the core 41 is within solenoid 28 is core 43. In other words,

when the control system has shifted into forward then the control system cannot be shifted directly into reverse, it must first be shifted to neutral by means of solenoid 30, which can also be established through the same mechanical means with respect to shifting from reverse to forward. An operating linkage 44, including a threaded rod 45, is connected to an eye 46 in a flange 47 of U shaped member 42. A threaded collar 48 engages the rod 45 and also engages a link 50. It is understood that this linkage can be constructed many ways, including a spring buffer mechanism to relieve shock at end of draw.

As best seen in FIGURE 3, the link 50 engages a shift lever 52 and may move this lever into one of three positions, R, N, and F, corresponding to reverse, neutral, and forward, respectively, of the gears (not shown). The lever 52 is normally a part of the motor as manufactured and is connected to the gear shift mechanism internally.

In operation, the motor is first started and brought to a suitable speed by actuating the throttle lever to a suitable position. Contact 14 has normally been engaged momentarily with contact 18 before the motor is started, the purpose being to shift the motor into neutral, all motors as manufactured having a safety feature preventing starting in gear. Relay 24 is therefore energized, contacts 24*a* and 24*b* are closed, and solenoid 30 is energized. Under these conditions U shaped bar 42 is in the position shown in full lines in FIGURE 2 and the lever 52 will be in its intermediate position, N, and the gears will be in neutral. Now, if it is desired to shift the motor into reverse, contact 14 of switch 12 is moved into engagement with contact 20, and depressed momentarily thus completing the circuit of relay 26. When relay 26 is energized, contacts 26*a* and 26*b* are closed, thus completing the circuit of reverse solenoid 32. Core 41 is now attracted into solenoid 32 causing U shaped member 42 to move to the dotted line position indicated in FIGURE 2 as position 53, pushing linkage 44. Lever 52 moves to position R and thus shifts the gears (not shown) into reverse.

When it is desired to shift the gears of the motor into forward, contact 14 is first moved into engagement with contact 18 causing the gears to be shifted into neutral, as previously described. Contact 14 is then momentarily moved into engagement with contact 16, thereby energizing forward relay 22. Energizing forward relay 22 closes contacts 22*a* and 22*b* thus completing the circuit of forward solenoid 28. When forward solenoid 28 is energized, core 41, which is held midway between solenoids 28 and 32, is attracted into solenoid 28, thus moving U shaped member 42 to the position shown in FIGURE 2 as position 55. This movement moves link 52 to the dotted line position designated F, thus shifting the gears of the motor into forward.

Since the selector on the shift switch 14 is in contact with 16, 18 and 20 of FIGURE 1 only at the moment when shifting is required, it must be depressed and moved from one position to the other. When released, the contact is broken and relay and solenoid are no longer energized. This eliminates drain on the battery. All motor manufacturers have some type of detent arrangement to hold shift in desired position, the same being internal construction in the motor.

Throughout the shifting operation, it is understood that a predetermined minimum speed was not exceeded during the shifting operation. Had this minimum been exceeded, speed responsive switch 35, which was mounted on the carburetor throttle linkage would have been opened thus preventing completion of the solenoid circuits for controlling the shifting of the gears. The closure of switch 35 is indicated at all times by the proper speed indicator lamp 40.

The details of the throttle lever and switch 12 are shown in FIGURES 4 and 5*a* through 5*g*. FIGURE 4 shows, in elevation, partly in section, a throttle lever 60 on which is mounted a suitable handle 62. The switch 12 is mounted in the top of handle 62 and includes a button 65 which contains a spring 67 and a contact 69. The spring biased button 69 corresponds to contact 14 in FIGURE 1. Button 65 makes contact with strip 71 to close the circuit to battery terminal 15 (FIGURE 1). Switch 12 also includes contact member 73, 75, and 77 positioned in the path of button 69. These contact members correspond to contacts 16, 18, and 20, respectively, in the wiring diagram of FIGURE 1. Contacts 73, 75, and 77 are connected through individual conductors 78, 79, and 80, respectively, to relays 22, 24 and 26 of FIGURE 1. All of these conductors are inclined to a suitable cable 81. The sliding contact button 65 is held in position by a suitable slotted plate 82 and suitable screws 83 and 85.

The details of switch 12 are shown in FIGURES 5*a* through 5*g*. FIGURE 5*a* shows the details of the push button with its encased spring 67 and the reciprocating contact 69. The button 65 is preferably formed of insulating material and has a brass body 87 secured thereto by suitable means not shown. FIGURE 5*g* shows one example of contacts 73 and 77 in which a brass button 73 is slidably mounted in a brass housing 89. A biasing spring 91 is locked in position by means of a spring locking pin 92 to bias the contact 73 into a terminal position. Contact 77 is similarly mounted and will therefore not be described.

FIGURES 5*b* and 5*c* are top and bottom views respectively of the contact block 74 while FIGURE 5*d* is an end view of this contact block. FIGURES 5*e* and 5*f* are detailed views of the neutral contact 75 and its associated contact spring 94. It is of course, understood that numerous other embodiments of contact switches may be employed without departing from the spirit of this invention since other forms of switches may be employed selectively to make contact with one of three contacts.

While only one illustrative embodiment of this invention has been described, it is understood that the concepts thereof may be applied to various other embodiments without departing from the spirit and scope of this invention.

What is claimed is:

1. A remote control system for shifting gears in an outboard motor having a forward-neutral-reverse gear shift lever thereon comprising a link connected to said gear shift lever, three solenoids inductively connected to said link for selectively positioning said link in the three positions corresponding to the forward-neutral-reverse positions of said gear shift lever, power source means connected in circuit with said solenoids and three position switch means in circuit with said solenoids for selectively connecting a corresponding one said solenoids to said power source means for each of the three positions wherein said solenoids include a pair of axially aligned solenoids with a common reciprocably mounted core positionable in a single one of said pair of solenoids and wherein said core is reciprocated to a position intermediate the two solenoids so that either of said pair of solenoids may inductively position the core by the selective energization of the third said solenoid, and means connecting the third solenoid to an intermediate neutral position of said switch means.

2. The system according to claim 1 further comprising a speed-responsive switch mounted on said motor and connected in circuit with said solenoids, whereby said power source is disconnected from said solenoids by said speed-responsive switch when the speed of said motor exceeds a predetermined minimum value.

3. The system defined in claim 2 including a visual indicator operable to indicate the proper motor speed range for shifting gears.

4. A remote control system for shifting gears in an

outboard motor having a forward-neutral-reverse gear shift lever comprising a link connected to said lever, a first, a second and a third solenoid positioned to cooperate with said link to selectively move said link into a plurality of positions corresponding to the several gear shift positions of said motor, said link including a U-shaped member having a pair of cores mounted on the forks of said U-shaped member, said cores being inductively movable by said solenoids, at least two of said solenoids being axially aligned for selectively positioning one of said cores in two positions, the other of said solenoids being positioned to cooperate with the other of said cores to position said link in an intermediate position with respect to the link positions produced by movement of said first-mentioned core into said two positions, power source means connected to said solenoids and switch means in circuit with said solenoids and said power source means for selectively connecting said solenoids to said power source means, said switch means including a manually operable three position switch mounted on a lever, which lever is mechanically connected to said motor for controlling the speed there-

of and means for operating the three solenoids in respective positions of said switch.

5. The system according to claim 4 further comprising a speed-responsive switch selectively coupled to said motor and connected in circuit between said solenoids and said power source, whereby said speed-responsive switch opens when said motor reaches a predetermined speed, thereby preventing energization of said solenoids and thereby preventing the shifting of gears of said motor.

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