

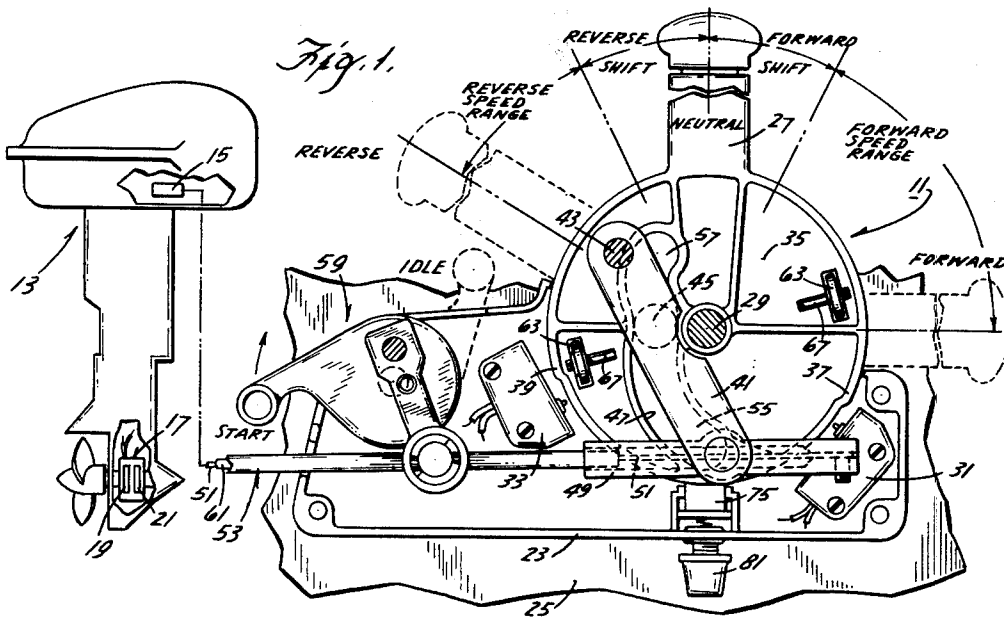
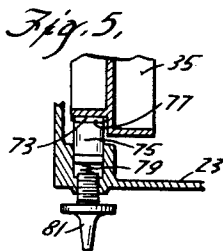
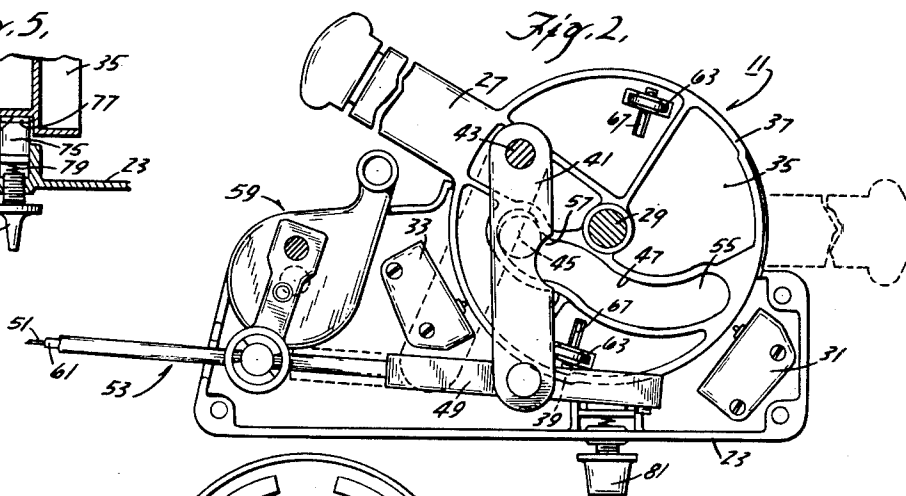
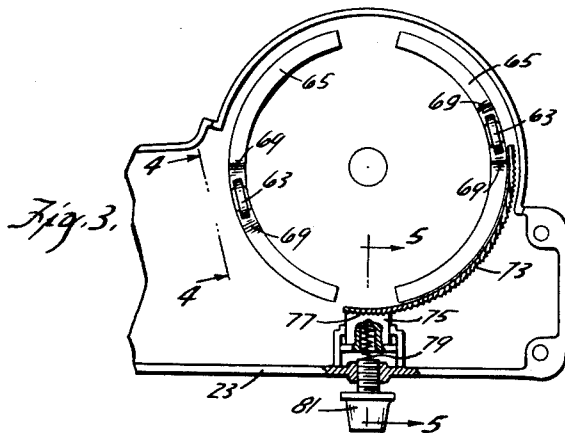
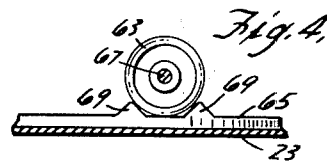
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3,139,767

SINGLE LEVER ELECTRICAL CONTROL

Filed March 2, 1962



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3,139,767

SINGLE LEVER ELECTRICAL CONTROL

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9 Claims. (Cl. 74-472)

The invention relates generally to shift and throttle control devices for internal combustion engines. More particularly, the invention relates to single lever, throttle and shift control devices and to internal combustion engines incorporating electromagnetic shift or clutch means.

The invention has for its principal object the provision of a single level throttle and clutch control device, including electrical switching means, for an engine having an electrically operated, electromagnetic clutching arrangement. The invention also has for its object the provision of a single lever actuating device for an electromagnetic clutch, said device incorporating a pair of switch means which, in co-operation with switch-actuating means on said lever, are selectively actuatable to effect operation of the engine in neutral, forward drive, and rearward drive conditions.

Other objects and advantages of the invention will become apparent by reference to the following description and the accompanying drawings of one embodiment.

In the drawings:

FIGURE 1 is a fragmentary view, partially in section and partially diagrammatic on a reduced scale, of a boat incorporating a control device in accordance with the invention;

FIGURE 2 is a view similar to a portion of FIGURE 1 showing the control device with the operating lever shown in its maximum rearward drive setting shown in full lines and with the maximum forward drive setting shown in dotted lines;

FIGURE 3 is a fragmentary, sectional view of a portion of the control device shown in FIGURES 1 and 2, with certain parts omitted, illustrating the frictional restraining means associated with the operating lever;

FIGURE 4 is an enlarged, fragmentary sectional view taken generally along line 4-4 of FIGURE 1; and

FIGURE 5 is an enlarged, fragmentary sectional view taken generally along line 5-5 of FIGURE 3.

The speed and clutch control device 11 illustrated in FIGURE 1 is intended for control of an engine 13 (shown schematically) having a throttle 15 and an electrically controlled clutch means or transmission 17, including a pair of electrically energizable coils 19 and 21, for enabling operating of the engine in neutral, in forward drive, and in rearward drive engagements. Forward drive engagement of the engine 13 is provided incident to energizing of the coil 19 and rearward drive engagement is provided incident to energizing of the coil 21. When neither of the coils 19 and 21 is energized, the engine 13 is in neutral. One example of an engine incorporating an electromagnetic reversing clutch is fully disclosed in my copending application, Serial No. 143,773, filed on October 9, 1961, entitled "Marine Propulsion Device with Electromagnetic Reversing Clutch," and assigned to the assignee of this invention.

Returning now to the speed and clutch control device 11, said device includes a frame 23 which can be suitably mounted on the hull of a boat 25, shown fragmentarily in FIGURE 1, and on which an operating lever or control member 27 is movably mounted. In the specifically disclosed construction, the operating lever 27 is pivotally mounted by means of a stud or rockshaft 29 for movement through respective forward and reverse shift ranges on either side of a neutral position, and for further movement through respective forward and reverse speed ranges.

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Also supported by the frame 23 are a pair of spaced, electrical switches 31 and 33 which are respectively electrically connected to the previously-mentioned coils 19 and 21. The switches 31 and 33 are normally open and are closed to actuate the coils by means on the operating lever 27 incident to shifting of the operating lever from its neutral position. More specifically, the operating lever 27 includes a generally circular disk portion 35 having along the periphery thereof two spaced, circumferentially extending projections 37 and 39 which are disposed relative to the switches 31 and 33 so that, when the operating lever is in neutral position, both switches are not engaged by the projections and remain open. However, the switch 31 connected to the coil 19 affording forward drive engagement of the engine 13 is closed by the projection 37 incident to clock-wise movement (as seen in FIGURE 1) of the operating lever 27 from its neutral position and the switch 33 connected to the coil 21 affording rearward drive engagement of the engine 13 is closed by the projection 39 incident to counter clock-wise movement (as seen in FIGURE 1) of the operating lever 27 from its neutral position. The projections 37 and 39 extend circumferentially of the disk portion 35 through sufficient distances to maintain the respective switches 31 and 33 closed during travel of the operating lever 27 through the associated speed ranges.

Control of the throttle setting, as an incident to movement of the operating lever 27, is provided by means including an arm 41 which is pivotally mounted at one end on a stud 43 supported by the frame 23 and which carries, intermediate its ends, a cam follower 45 engaged in a cam slot 47 formed in the disk portion 35 of the operating lever 27. At its other end the arm 41 is pivotally connected to an anchor block or member 49 which, in turn, is fixedly connected to the internal wire 51 of a conventional push-pull cable 53 operably connected to the throttle 15. The cam slot 47 is designed to maintain the throttle at an idle setting when the operating lever 27 is in its neutral position and during movement through both shift ranges. The cam slot 47 is further designed so that a full speed range is available when the engine 13 is in forward drive engagement, and so that a limited speed range is available when the engine 13 is in rearward drive engagement. More particularly, the cam slot 47 includes two arcuate extensions or lobes 55 and 57 which, at their outer portions, result in clock-wise displacement of the arm 41 as seen in FIGURES 1 and 2 and accompanying displacement to the left of the anchor block 49 and attached internal wire 51 of the push-pull cable 53. As shown in the dotted outline in FIGURE 2, movement of the operating lever 27 to the end of the forward speed range produces a greater movement of the anchor block 49 to the left, thereby setting the throttle 15 at a greater power level, than does movement of the operating lever 27 to the end of its rearward speed range.

The control device 11 also incorporates an auxiliary throttle control 59 operable to shift an outer sleeve 61 of the push-pull cable relative to the interior wire 51 so as to obtain an increased throttle setting when the engine 13 is in neutral.

Also incorporated in the control device 11 are two frictional restraining arrangements for respectively releasably retaining the operating lever 27 in its neutral position and for preventing unwanted shifting of the operating lever 27 from any desired throttle setting in the forward speed range.

Releasable retention of the operating lever 27 in its neutral position is provided through co-operation of a pair of rollers 63 and a detent track 65. More specifically, the rollers are diametrically oppositely supported on axes 67 which extend radially of the rockshaft 29 and which

are resiliently shiftable out of a plane perpendicular to the rock-shaft. The detent track 65, as seen in FIGURE 4, includes two spaced pairs of lugs 69, each of which pairs receives one of the rollers 63 therebetween when the operating lever 27 is in its neutral position.

The arrangement for retaining the throttle setting at any desired position in the forward speed range includes, as shown in FIGURES 3 and 5, a flange portion which extends from along a part of the periphery of the disk portion 35 and which has a peripheral serrated edge 73. Slideably carried on the frame 23 is a block 75 having a serrated section 77 adapted for engagement with the serrated edge 73. The block 75 is biased into engagement with the serrated edge 73 by a suitable spring 79. Control of the degree of frictional restraint opposing movement of the operating lever 27 is provided by a control button 81 which is threadably mounted in the frame 23 in engagement with the spring 79 so as to effect variation in the spring precompression urging the serrated section 77 against the serrated edge 73.

In operation, when the operating lever 27 is moved, clock-wise, as seen in FIGURE 1, through the forward shift range, the projection 37 initially serves to close the switch 31, thereby energizing the coil 19 and shifting the engine 13 into forward drive, and to maintain the switch 31 in closed condition during movement of the operating lever through the forward speed range. During movement of the operating lever through the forward shift range, engagement of the follower 45 in the cam slot 47 retains the throttle setting of the engine 13 in idle. However, during movement of the operating lever 27 through the forward speed range, the throttle setting is adjusted incident to rocking of the arm 41 in response to engagement of the follower 45 in the cam slot 47. When it is desired to return the engine 13 to neutral or to shift into reverse, the operating lever 27 is rotated counter clock-wise, as seen in FIGURE 1, through the forward shift range, to the neutral position, and, if desired, into the rearward shift range and rearward speed range.

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

What is claimed is:

1. A control device for an engine having a throttle and a pair of electrically energized clutches which are selectively operable to effect operation of said engine in neutral, forward drive, and rearward drive conditions, said control device comprising
a frame,
a control member,
means for movably mounting said control member on said frame for movement through an arcuate path from a central neutral position through a shift range on either side of said neutral position and through a speed range extending from each of said shift ranges,
a pair of electrical switch means respectively electrically connectable to said pair of electrical clutches,
means mounting said switch means on said frame in spaced relation to each other,
means on said control member for selectively actuating said switch means, said switch actuating means being located in relation to said switch means such that said switch actuating means is inoperably disposed relative to said switch means when said control member is in said neutral position and so that one of said switch means is operated by said switch actuating means during movement of said control member through said shift range on one side of said neutral position to effect operation of said engine in forward drive condition and so that said switch actuating means operates the other of said switch means to effect operation of said engine in rearward drive condition during movement of said control member through said shift range on the other side of said neutral position,
a linearly displaceable speed control member connected

to the throttle of said engine to control the setting thereof,

means on said frame mounting said speed control member for movement relative to an idle position, and
means connecting said speed control member to said control member for retaining said speed control member in said idle position during movement of said control member through said shift ranges and for displacing said speed control member relative to said idle position during movement of said control member through said speed ranges.

2. A device in accordance with claim 1 wherein said means connecting said speed control member to said control member comprises an arm mounted on said frame and connected to said speed control member, a camming slot in said control member, and a cam follower on said member.

3. A control device in accordance with claim 1 wherein said switch means constitute normally open switches and wherein said switch actuating means is operable to initiate respective closure of said switches during movement of said control member through said shift ranges and to respectively retain said switches closed during movement of said control member through said speed ranges.

4. A device in accordance with claim 3 wherein said switch actuating means comprises spaced projections on portions of the periphery of said control member.

5. A control device for an engine having a throttle and a transmission including a pair of energizable coils which are selectively operable to effect operation of said engine in neutral, in forward drive, and in rearward drive conditions, said control device comprising a frame, a control lever including one portion with a peripheral segment of generally circular formation, and a handle portion extending from said one portion, means mounting said control lever for pivotal movement about the center of said peripheral segment in opposite directions from a central neutral position, a pair of spaced, electrical switch means mounted on said frame at a common distance from the pivotal mounting of said control lever and in angularly spaced relation to each other, said switch means being adapted to be respectively connected to said pair of coils, spaced means on said peripheral segment of said one control lever portion for actuating one of said switch means incident to movement of said control lever in one direction from said central neutral position and for actuating the other of said switch means incident to movement of said control lever in the other direction from said central neutral position, a displaceable member connected with said frame and adapted to be connected to the engine throttle for effecting operation thereof, an arm pivotally mounted on said frame and pivotally connected to said displaceable member to effect shifting of said displaceable member in response to pivotal movement of said arm, a follower on one of said one control lever portion and said arm, a cam slot engaged by said follower in the other of said one control lever portion and said arm, said cam slot having means defining a central portion for permitting sufficient movement of said control lever from said neutral position to effect actuation of said switch means without effecting pivotal movement of said arm, and means defining extensions from said central portion for pivoting said arm from its position defined by engagement of said follower in the central portion of said cam slot in response to movement of said control lever beyond that point which is effective to actuate said switch means.

6. A control device for an engine having a throttle and a transmission including a pair of energizable coils which are selectively operable to effect operation of said engine in neutral, in forward drive, and in rearward drive conditions, said control device comprising a frame, a control lever including one portion with a peripheral segment of generally circular formation, and a handle portion extending from said one portion, means mount-

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ing said control lever for pivotal movement about the center of said peripheral segment from a central neutral position through a forward shift range on one side of said central neutral position, through a rearward shift range on the other side of said central neutral position, and through forward and rearward speed ranges extending respectively from said forward and rearward shift ranges, a pair of spaced, electrical switch means mounted on said frame at a common distance from the pivotal mounting of said control lever and in angularly spaced relation to each other, said switch means being adapted to be respectively connected to said pair of coils, spaced means on said peripheral segment of said one control lever portion for actuating one of said switch means incident to movement of said control lever through said forward shift and speed ranges and for actuating the other of said switch means incident to movement of said control lever through said rearward shift and speed ranges, a linearly displaceable member connected with said frame and adapted to be connected to the engine throttle for effecting operation thereof, an arm pivotally mounted on said frame and pivotally connected to said linearly displaceable member to effect linear shifting of said displaceable member in response to pivotal movement of said arm, a follower on one of said one control lever portion and said arm, a cam slot engaged by said follower in the other of said one control lever portion and said arm, said cam slot having means defining a central portion for permitting movement of said control lever through said shift ranges without effecting pivotal movement of said arm, and means defining extensions from said central portion for pivoting said arm from its position defined by engagement of said follower in the central portion of said cam slot.

7. A control device for an engine having a throttle and electrically operated clutch means, said control device comprising a frame, a lever mounted on said frame for movement relative to a neutral position, means for electrically controlling operation of the engine clutch means including electrical switch means adapted to be electrically connected to said clutch means to effect operation thereof, and means for actuating said switch means incident to movement of said lever from said neutral position, linearly displaceable means mounted on said frame and adapted to be connected to said throttle to effect operation of said throttle in response to linear displacement, and means on said frame actuated by movement of said lever for linearly displacing said linearly displaceable means to thereby control said throttle, said means for linearly displacing said linearly displaceable means including means for retaining said linearly displaceable means in a constant position until after actuation of said switches in response to movement of said lever from said neutral position, thereby maintaining the throttle setting constant until after actuation of said switch means.

8. A control device for an engine having a throttle and a transmission including a pair of electrically energizable coils which are selectively operable to effect operation of

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said engine in neutral, forward drive, and rearward drive conditions, said control device comprising a frame, a control member, means mounting said control member on said frame for movement through an arcuate path from a central neutral position through respective forward and rearward shift ranges to each side of said neutral position and through respective forward and rearward speed ranges extending respectively from said forward and rearward shift ranges, said switch actuating means being located in relation to said switch means so that said switch actuating means is inoperably disposed relative to said switch means when said control member is in its neutral position and so that one of said switch means is operated by said switch actuating means during movement of said control member through said forward shift and speed ranges and so that said switch actuating means; operates the other of said switch means incident to movement of said control member through said rearward shift and speed ranges, a displaceable member adapted for connection to the engine throttle for control thereof, and means connecting said displaceable member with said control member for displacement of said displaceable member in response to arcuate movement of the control member, said connecting means including means maintaining said displaceable member in constant position during movement of said control member through said shift ranges.

9. The combination of an engine including a throttle and transmission means with electrically operated clutch means for shifting said transmission means, and a control device located remotely from said engine, said device including a lever mounted thereon for movement relative to a neutral position, electrical switch means mounted on said device and electrically connected to said clutch means, means on said lever for actuating said switch means incident to movement of said lever from said neutral position so as to shift said transmission means, linearly displaceable means connected to said throttle for controlling the setting thereof, and means connected to said linearly displaceable means and to said lever for displacing the former in response to movement of the latter and including means for retaining said linearly displaceable means in constant position until after actuation of said switch means in response to movement of said lever from said neutral position, thereby maintaining said throttle setting constant until after actuation of said switch means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,139,767

July 7, 1964

William J. Shimanckas

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 9, after "ranges," insert -- a pair of spaced electrical switch means on said frame adapted to be respectively connected to said pair of coils, means on said control member for selectively actuating said switch means to effect operation of said engine in either of said neutral, forward drive, and rearward drive conditions incident to movement of said control member, --; same column 6, line 16, after "means" strike out the semi-colon.

Signed and sealed this 4th day of May 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents