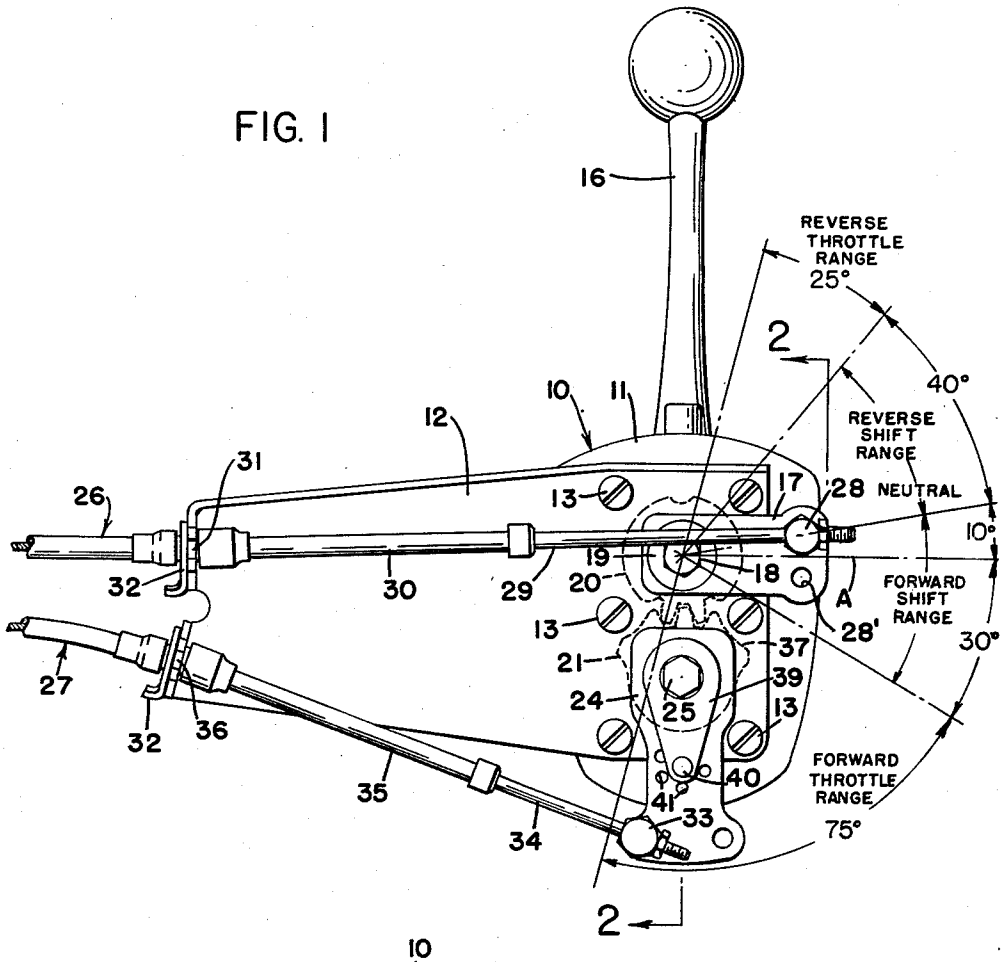
May 10, 1960 J. F. MORSE 2,935,891

THROTTLE AND TRANSMISSION OPERATING MECHANISM FOR SINGLE LEVER ENGINE CONTROL

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FIG. 1



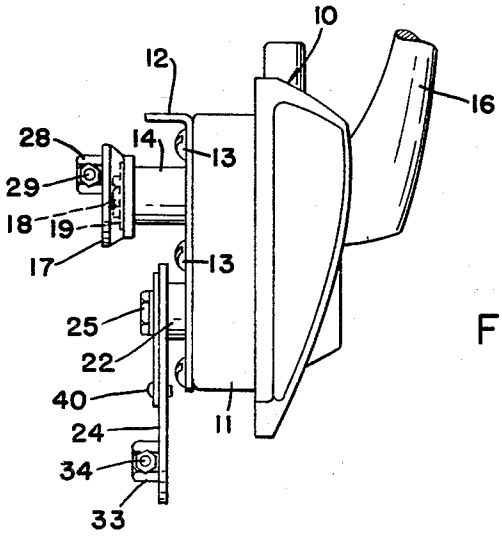


FIG. 2

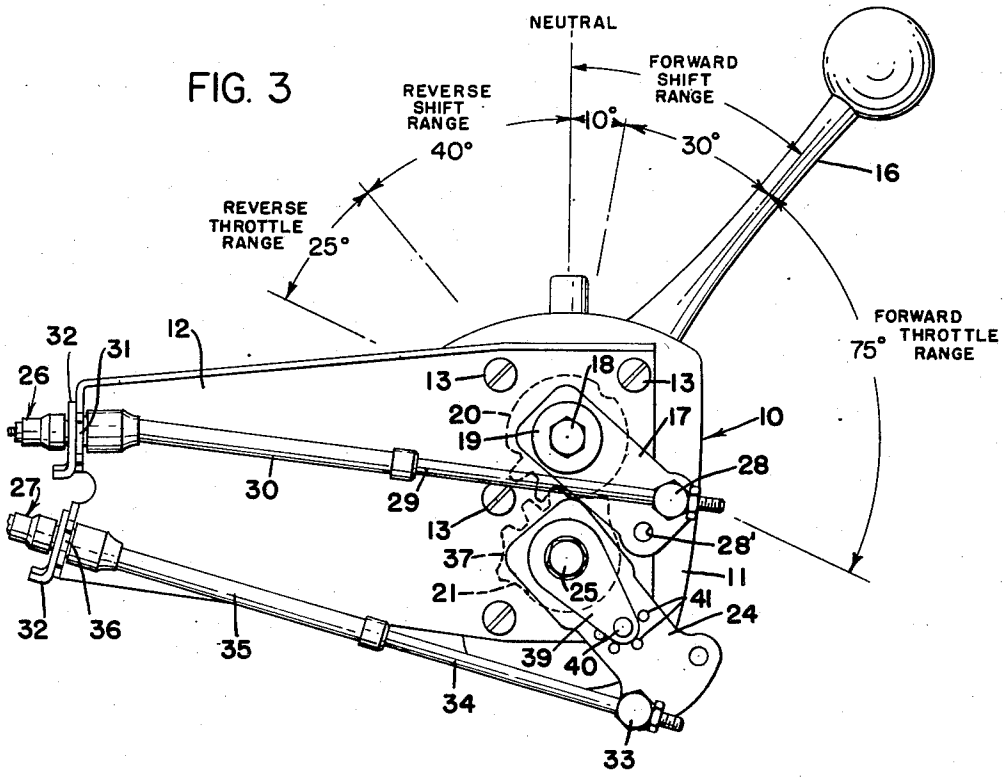
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FIG. 3



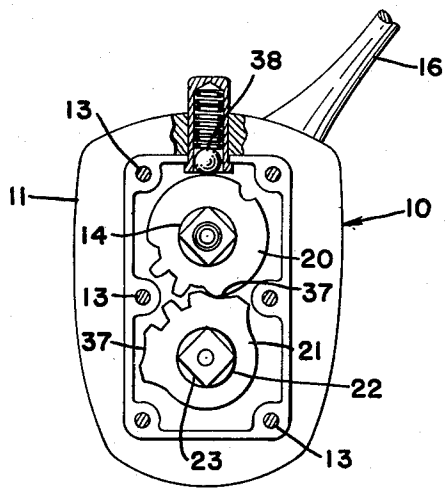


FIG. 4

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THROTTLE AND TRANSMISSION OPERATING MECHANISM FOR SINGLE LEVER ENGINE CONTROL

John F. Morse, Hudson, Ohio

Application June 4, 1958, Serial No. 739,711

4 Claims. (Cl. 74—472)

The invention relates generally to remote single lever controls for marine engines, and more particularly to improved mechanism for reducing advance of the engine throttle as the single control lever is moved from neutral through the forward shifting range.

In single lever controls for marine engines, the clutch and throttle control arms are geared together so that movement of the single control lever forward from neutral position first engages the engine clutch in forward position and then advances the throttle as the boat moves forward, while movement of the control lever rearward from neutral position first engages the engine clutch in reverse position and then advances the throttle as the boat moves astern. The forward throttle range is normally substantially greater than the reverse throttle range, as advanced speeds in reverse are not desirable or necessary.

In such control systems, the control lever is connected to the engine throttle lever by a linkage which may include a push-pull cable, and a small advance of the throttle normally inherently occurs when the control lever is moved in either direction through the clutch shifting range. Some of this throttle advance movement is absorbed by backlash in the system, particularly where push-pull cables of substantial length are present, but a slight advance of the throttle still takes place in practically all systems as the control lever is moved through the shifting range.

While this slight advance of the throttle does not normally damage the shifting mechanism because the shifting is completed before the throttle has accelerated the engine enough to cause damage, nevertheless, at the end of the shifting range the throttle has been advanced sufficiently to drive the engine substantially faster than the idling speed at neutral position of the control lever.

Moderately accelerated speeds in reverse are not objectionable because reversal of the engine is usually employed to stop or slow down forward motion of the boat, and furthermore the propeller is much less efficient in reverse. However, in boats used as pleasure craft it is very desirable to operate the boat at very low forward speeds, as for example in trolling for fish.

The purpose of the present invention is to provide an improved single lever control which enables operating a marine engine at minimum forward speeds substantially equivalent to idling speed at neutral.

A further object is to provide an improved throttle operating arm mechanism in a single lever control unit for reducing the amount of throttle advance as the control lever is moved through the forward shifting range.

A still further object is to provide a simple and improved throttle operating arm which is adapted for use with prior single lever engine control units when minimum forward speeds are required.

These and ancillary objects which will appear from the following description are attained by the improvements comprising the present invention, a preferred embodiment of which is shown by way of example in the accompanying drawings, in which:

Fig. 1 is a rear side elevation of a single lever control unit embodying the invention, with the control lever in neutral position.

Fig. 2 is a front end elevation as on line 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 1, with the control lever at the start of the forward throttle range.

Fig. 4 is a similar view with the throttle and clutch control arms and cable mounting plate removed to show the interrupted gears operatively connecting the arms.

The control unit indicated generally at **10** has a housing **11** adapted for attachment to a mounting pad in the side of a boat, and the inner face of the housing may be attached to a bracket plate **12** by screws **13**. A throttle control arm shaft **14** is journaled in housing **11** and has the single control lever **16** keyed on its front end in a suitable manner. A throttle arm **17** is non-rotatively secured on the projecting rear end of the shaft **14** by a screw **18** and washer **19**.

An interrupted gear **20** keyed on shaft **14** within the housing meshes in neutral position with an interrupted gear **21** keyed on a clutch control arm shaft **22** also journaled in the housing **11**. The shaft **22** has a rearwardly projecting squared end **23** on which the clutch control or shifting arm **24** is non-rotatively mounted by a screw **25**.

The gears **20** and **21** may have the same pitch as shown, in which case a 45° movement of the control lever **16** and the throttle arm **17** in either direction rotates the shifting arm **24** through 45° in the opposite direction. However, the relative pitches of the two gears may vary as desired.

The throttle control arm **17** is operatively connected to the usual throttle lever (not shown) of the engine, and the clutch control arm **24** is operatively connected to the usual shift lever or clutch lever (not shown) of the engine. In the embodiment shown the throttle and clutch control arms are connected respectively to the engine by push-pull cables **26** and **27** of the "swivel-end" type, in which the ends of the cable casing are rigidly mounted on the bracket plate **12** of the control unit, and extensible links pivotally connect the cables to the arms to compensate for the arcuate motion of the arms.

The outer end of throttle control arm **17** has a swivel connector **28** connected to the end of a push rod **29** which telescopes within a sleeve **30** and is connected to the core of cable **26**, and the opposite end of the sleeve has a swivel connection with a bushing **31** secured in the end flange of bracket plate **12** by a clip **32**. The casing of cable **26** is secured in the bushing. Similarly, the outer end of clutch control arm **24** has a swivel connector **33** connected to a push rod **34** which telescopes within a sleeve **35** and is connected to the core of cable **27**, and the opposite end of sleeve **35** has a swivel connection with a bushing **36** secured in the end flange of bracket plate **12** by a clip **32**. The casing of cable **27** is secured in the bushing **36**. The push rods and sleeves comprise linkages pivotally connecting the arms **17** and **24** to the cables.

When the gear **20** is rotated about 45° in either direction, the gear segment on gear **20** becomes unmeshed from the segment on gear **21**, as indicated in Fig. 4, and during further rotation of gear **20** through the throttle range one of the arcuate faces **37** on gear **21** engages the circular edge of gear **20** as it continues to rotate, so that the clutch control arm is held stationary as the throttle is advanced. A spring-biased ball detent **38** may be provided in the housing **11** to yieldingly restrain the gear **20** in neutral position.

The operation of the throttle and clutch levers of the engine by the interrupted gears and push-pull cables is well-known and per se forms no part of the present invention.

The shifting lever **24** may be made slidable radially on

the shaft 22, and may have a gage plate 39 thereon having a pin 40 at its outer end for selectively entering one of a series of holes 41 in the arm to adjust the radial length of the arm. The construction and operation of the adjustable arm is the subject of my copending application Serial No. 737,404, filed May 23, 1958, and entitled Shifting Arm For Single Lever Control.

As shown, the throttle control arm 17 extends forwardly of the shaft 14 in the neutral position of Fig. 1, so that rotation of the shaft in either direction exerts a push on the push rod 29 which is transmitted by the core of cable 26 to the throttle lever of the engine. By reversing the position of arm 17 through 180°, it can be attached to a pull rod for operating a pull-open throttle. However, the position shown of arm 17 causes less displacement of the push rod 29 in the shifting range than with the arm in reversed position, because in the former position the arm 17 and push rod 29 are swinging in the same general direction on different arcs.

According to the present invention, the outer end of arm 17 is widened so that the swivel connection at 28 with the arm in neutral position is offset into the normal reverse range, or in other words about 10° toward the reverse side from a position indicated by line A in alignment with the throttle arm shaft and the linkage connecting it to the casing of cable 26 anchored to bracket plate 12. The hole 28' at the opposite side of the arm is provided for attaching the swivel 28 in a control unit of the opposite hand.

Referring to Fig. 1, as the arm 17 is swung forwardly through 10° by the control lever 16 from the offset neutral position shown, no displacement of the push rod 29 toward cable 26 will take place to advance the throttle. As the arm 17 is swung into the forward range some 30° more, the arc described by swivel connection 28 will cause a slight displacement of the push rod 29 toward cable 26, but it will be substantially less than if the arm was swung 40° from the normal aligned neutral position.

The forward and reverse ranges have been shown at 40° each since, for practical purposes, the shift is completed at 40° although the gear 21 is not completely unmeshed from gear 20 until the gears are rotated through 45°. The various ranges of movement of the swivel connection with the thorttle arm are shown in Fig. 1, and the corresponding ranges of movement of the single control lever 16 are shown in Fig. 3. The upright neutral position of lever 16 corresponds to the offset neutral position of the throttle arm with respect to line A.

Due to the offset arrangement of the throttle arm in neutral, the forward shift may be completed without appreciably advancing the throttle and at the beginning of the forward throttle range the throttle will be substantially at idling speed. Hence the engine can be operated to drive the boat forwardly at minimum speeds for trolling and the like.

It is apparent that the offset arrangement will increase the displacement of push rod 29 and consequent advance of the throttle during the reverse shift range because the arc through which the throttle arm is swung will be increased by 10°. However, as previously mentioned, a moderate advance of the throttle during the reverse shift is not objectionable because of the inefficiency of the propeller in reverse and because reversal of the engine is usually employed to stop or retard the speed of the forward motion of the boat. Further, minimum speeds in reverse are not necessary for trolling.

The improved throttle control arm is adapted to easily replace an arm having an aligned swivel connection, whenever it is desired to provide for minimum forward speeds.

Various embodiments and changes in details of construction are comprehended within the scope of the invention defined in the appended claims.

What is claimed is:

1. In a single lever marine engine control unit having a throttle control shaft and a clutch control shaft operatively connected thereto for rotation through a shifting range only during the first part of rotation of the throttle control shaft in forward and reverse directions from neutral, said shafts being connected to linkages for transmitting movement to the throttle and clutch controls of the engine, the improvement comprising an arm secured on said throttle control shaft having a swivel connector at its outer end for connection to the throttle actuating linkage, said swivel connector in the neutral position of the throttle control shaft being offset toward the reverse side of a position in alignment with said shaft and the throttle actuating linkage, whereby when the throttle control shaft is rotated through the forward shifting range the movement transmitted to the throttle actuating linkage is reduced.

2. In a single lever marine engine control unit having a throttle control shaft and a clutch control shaft operatively connected thereto for rotation through a shifting range of the order of about 45° only during the first part of rotation of the throttle control shaft in forward and reverse directions from neutral, said shafts being connected to linkages for transmitting movement to the throttle and clutch controls of the engine, the improvement comprising an arm secured on said throttle control shaft having a swivel connector at its outer end for connection to the throttle actuating linkage, said swivel connector in the neutral position of the throttle control shaft being offset about 10° toward the reverse side of a position in alignment with said shaft and the throttle actuating linkage, whereby when the throttle control shaft is rotated through the forward shifting range the movement transmitted to the throttle actuating linkage is reduced.

3. In a single lever marine engine control unit having a throttle control shaft and a clutch control shaft operatively connected thereto for rotation through a shifting range only during the first part of rotation of the throttle control shaft in forward and reverse direction from neutral, said shafts being connected to linkages for transmitting movement to push-pull cables anchored at one end of said control unit, the improvement comprising an arm secured to the throttle control shaft having a swivel connector at its outer end for connection to the throttle actuating linkage, said swivel connector in the neutral position of the throttle control shaft being offset toward the reverse side of a position in alignment with said shaft and the anchored end of the push-pull cable operatively connected thereto, whereby when the throttle control shaft is rotated through the forward shifting range the movement transmitted to the throttle actuating linkage is minimized.

4. In a single lever marine engine control unit having a throttle control shaft and a clutch control shaft operatively connected thereto for rotation through a shifting range of the order of about 45° only during the first part of rotation of the throttle control shaft in forward and reverse direction from neutral, said shafts being connected to linkages for transmitting movement to push-pull cables anchored at one end to said control unit, the improvement comprising an arm secured to the throttle control shaft having a swivel connector at its outer end for connection to the throttle actuating linkage, said swivel connector in the neutral position of the throttle control shaft being offset about 10° toward the reverse side of a position in alignment with said shaft and the anchored end of the push-pull cable operatively connected thereto whereby when the throttle control shaft is rotated through the forward shifting range the movement transmitted to the throttle actuating linkage is minimized.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,935,891 May 10, 1960

John F. Morse

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

Column 4, line 42, for "of said control unit" read -- to said control unit --; line 75, list of references cited, for the patent number "2,836,383" read -- 2,826,283 --.

Signed and sealed this 1st day of November 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents