Nov. 30, 1965 F. T. IRGENS 3,220,281

SINGLE LEVER CONTROL

Filed March 12, 1964 2 Sheets-Sheet 1

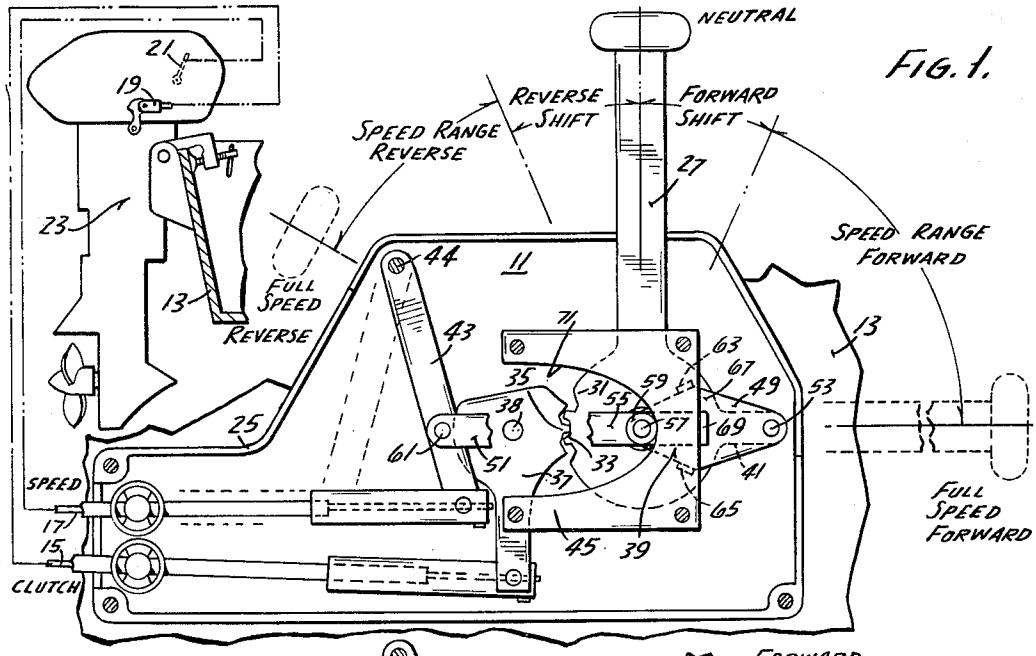

FIG. 1.

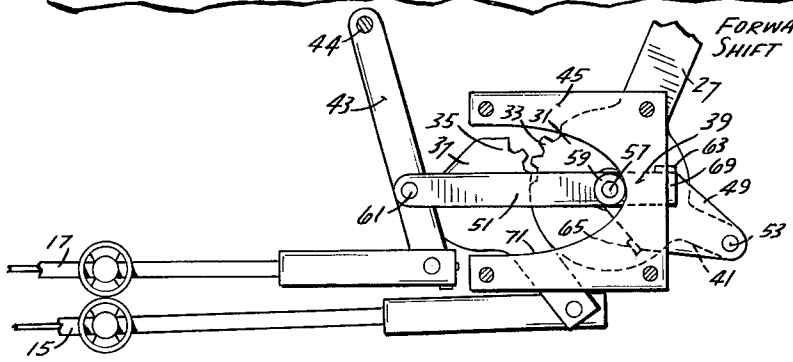

FIG. 2.

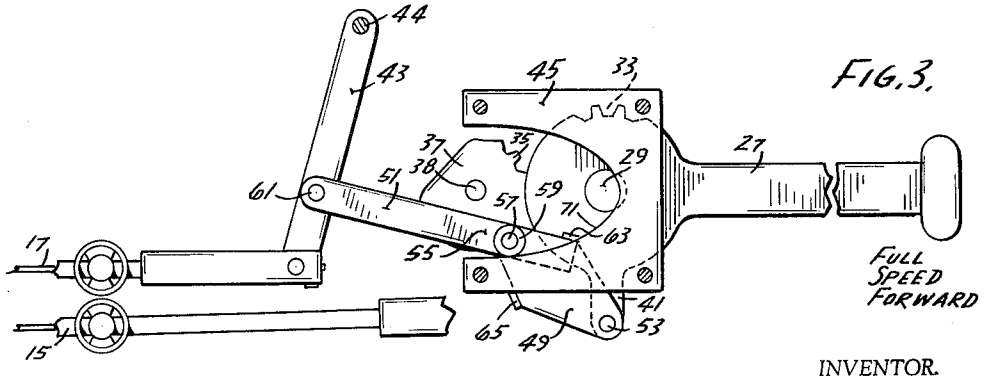

FIG. 3.

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SINGLE LEVER CONTROL

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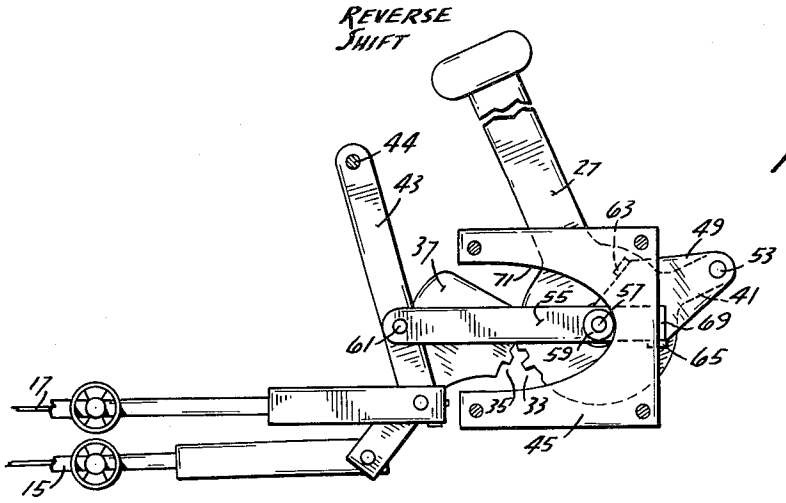

FIG. 4.

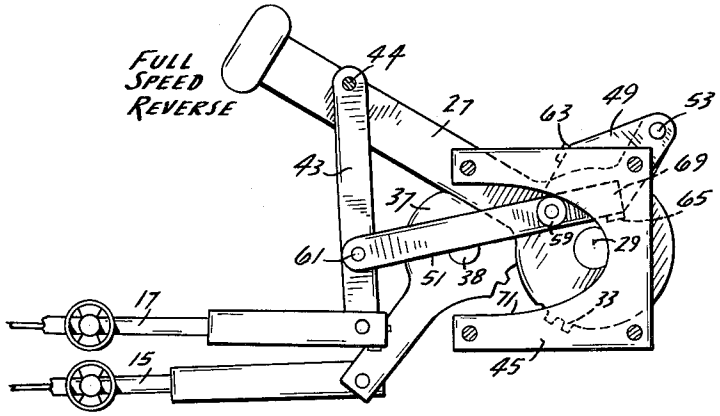

FIG. 5.

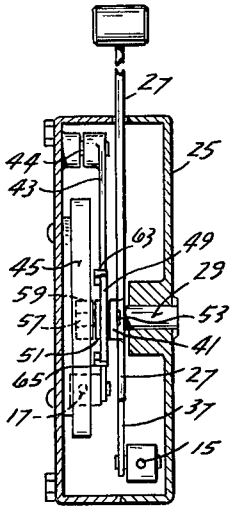

FIG. 6.

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SINGLE LEVER CONTROL

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4 Claims. (Cl. 74—472)

The invention relates generally to single lever controls for operating an engine having a throttle and clutch means. More particularly, the invention relates to such controls in which a pivotally mounted single lever is movable in both directions from a central position, through a shift range and then through a speed range. In such devices, it is desirable to eliminate or at least minimize throttle advance during movement of the control lever through the shift ranges to prevent shifting action at unduly high speeds.

The invention provides a linkage which interconnects a single control lever with a rocker arm connectable to the throttle of an engine for control thereof and which includes an angular lost motion arrangement, together with a stationary cam having a surface which is engaged by the linkage. The cam surface and linkage comprise means for delaying swinging movement of the rocker arm to effect throttle advance until after passage of the control lever through the shift ranges.

In the preferred embodiment, the linkage comprises two links which are pivotally connected by a pin carrying a follower engaging the camming surface and which include interacting parts limiting angular lost motion between the links.

Other objects and advantages of the invention will become known by reference to the following description and the accompanying drawings in which

FIGURE 1 is a side elevational view, partially schematic, partially in section, and partially on a reduced scale, of a control which embodies various of the features of the invention, which is shown mounted in a boat and connected to an outboard motor; and which is illustrated with the control lever in neutral;

FIGURE 2 is a fragmentary view similar to FIGURE 1 showing the components of the control device wherein the single control lever is intermediate the forward shift range and the forward speed range;

FIGURE 3 is a fragmentary view similar to FIGURE 2 showing the components of the control device wherein the single control lever is at the high speed end of the forward speed range;

FIGURE 4 is a view similar to FIGURE 2 showing the components of the control device wherein the single control lever is located intermediate the rearward shift range and the rearward speed range;

FIGURE 5 is a view similar to FIGURES 2, 3, and 4 showing the components of the control device wherein the control lever is at the high speed end of the rearward speed range; and

FIGURE 6 is a vertical sectional view taken through the device shown in FIGURE 1.

Shown in the drawings is a control device **11** which is mounted on the hull **13** of a boat and which is operably connected by cables **15** and **17** to the clutch **19** and throttle **21**, respectively, of an outboard motor **23** also supported by the hull **13**. The control device **11** includes a housing or frame **25**, a single lever **27**, and means **29** (see FIGURE 6) mounting the single lever **27** for swinging movement relative to a central neutral position, through forward and reverse shift ranges on opposite sides of the neutral position, and through speed ranges beyond the shift ranges. Any suitable means can be employed for pivotally mounting the lever **27**.

Connected to the single lever **27** are means for actuating the throttle **21** and for controlling the clutch **19** for shifting into forward, reverse, or neutral. Various arrangements, well known in the art, both electrical and mechanical can be used for controlling the clutch, provided that the clutch is in neutral when the control lever is in its neutral position and provided that the clutch is respectively shifted into forward and rearward drives when the control lever is displaced through the respective forward and reverse shift ranges.

In the disclosed construction, the single lever includes a portion **31** having a cylindrical periphery and an interrupted tooth segment **33**. The tooth segment **33** is intended for meshing engagement with an interrupted tooth segment **35** on a rocker arm **37** which is pivotally mounted by the housing at **38** and which is connected to the engine clutch **19** for control thereof by means of the push-pull cable **15**.

The means for controlling the engine throttle **21** comprises a linkage **39** interconnecting a forwardly projecting portion **41** of the single lever **27** and a rocker arm **43** which is pivotally carried by suitable means **44** on the housing **25** and which is connected to the engine throttle **21** by the push-pull cable **17**. The throttle controlling means also includes, in addition to the linkage **39**, a stationary cam **45** which coacts with the linkage **39** to swing the rocker arm **43** to afford throttle advance after movement of the control lever **27** through the shift ranges.

More specifically, the linkage **39** comprises first and second links **49** and **51**. The first link **49** is connected, at one end, to the forward part of the control lever portion **41** by means in the form of a pivot pin **53**. At its other end, the first link **49** is pivotally connected to an intermediate part **55** on the second link **51** by means affording angular lost motion therebetween. In the disclosed construction, such means take the form of a pivot pin **57** which carries a follower in the form of a roller **59** for a purpose still to be explained. At its rear end, the second link **51** is pivotally connected to the rocker arm **43** at a point spaced from the means **44** pivotally mounting the rocker arm on the housing **25** by means in the form of a pin **61**.

Means are provided on the links **49** and **51** to limit the extent of angular lost motion therebetween comprising a pair of spaced ears or tabs **63** and **65** on an intermediate part **67** of the first link **49** and a part **69** of the second link **51** which projects forwardly of the pivot pin **57** and is engageable with the tabs **63** and **65**.

The stationary cam **45** is mounted on the housing by suitable means and includes means for displacing the rocker arm **43** through said second link **51** in response to displacement by the control lever **27** of the first link **49**. In the disclosed construction, such means takes the form of a rearwardly open, hyperbolically shaped, camming surface **71** which is engaged by the aforementioned roller **59**.

In operation, when the control lever **27** is initially swung forward, i.e., to the right in the drawings and through the forward shift range to the position shown in FIGURE 2, the first link **49** is rocked in a clockwise direction about the pivot or pin **57** which is located by means of engagement of the roller **59** at the apex or bottom of the camming surface **71**. Thus, during such travel through the shift range, there is no displacement of the throttle **21** due to lost angular movement between links **49** and **51**.

However, when the control lever **27** enters into the forward speed range, the ear or tab **63** is engaged by the projecting part **69** of the second link **51** to prevent further angular lost motion between the links **49** and **51**. Consequently, the first and second links now act as a unitary

member pivotally connected, at one end, to the pin **53** which traverses a circular path in response to displacement of the control lever **27**. Intermediate its ends, the temporarily unitary member supports the roller **59** in engagement with the cam surface **71**, and, at its other end, is connected to the pin **61** which is traversable through another circular arc. As a result, the temporarily rigid linkage **39** is guided for clockwise movement as seen in FIGURE 3 and for movement of the link **51** to the left, as also seen in FIGURE 3, thereby rocking the arm **43** in a clockwise direction to advance the throttle **19**.

When the control lever **27** is swung rearwardly or in a counterclockwise direction in the forward speed range, engagement of the roller **59** with the cam surface **71** causes the first and second links **49** and **51** to be temporarily retained in rigid relation until the roller **59** reaches the apex or bottom of the camming surface **71**. At this point, the throttle has been returned to idle. Continued movement of the control lever **27** in the counterclockwise direction through the forward shift range results in disengagement of the tab **63** from the projecting part **69** of the second link **51** and permits angular lost motion between the links **49** and **51** until the parts are again as shown in FIGURE 1. Rearward or counterclockwise movement of the control lever from its neutral position through the rearward shift and speed ranges and return movement to the neutral position is accomplished in generally the same manner as explained in respect to forward shifting and speed control and as shown in FIGURES 4 and 5.

It is to be especially noted that the shape of the camming surface serves to retain the links **49** and **51** in rigid assembly during throttle advancing and throttle decreasing movement in both speed ranges.

It is also to be noted that there is no advance of the throttle during movement of the control lever in the shift ranges.

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

What is claimed is:

1. A single lever control comprising a frame, a control lever, means pivotally mounting said control lever on said frame, a rocker arm adapted to be connected to the throttle of an engine, means pivotally mounting said rocker arm on said frame, a linkage comprising pivotally connected first and second links, means on said connected links for limiting angular lost motion between said links, and means adapted for engaging a camming surface, means pivotally connecting said linkage and said lever, means pivotally connecting said linkage and said rocker arm, and a stationary camming plate on said frame, said plate including a camming surface engaged by said means adapted for engagement thereof and comprising means for displacing said means pivotally connecting said rocker arm and said linkage about said means pivotally mounting said rocker arm to thereby rock said rocker arm in response to displacement by said control lever of said means pivotally connecting said linkage and said lever.

2. A single lever control comprising a frame, a control lever, means pivotally mounting said control lever on said frame for movement in one direction from a neutral setting, means connected to said control lever and adapted to be connected to the clutch of an engine for actuation thereof in response to initial movement of said lever in said one direction from said neutral setting, a rocker arm adapted to be connected to the throttle of an engine, means pivotally mounting said rocker arm on said frame to vary the setting of the engine throttle in response to rocker arm movement, a linkage comprising pivotally connected first and second links, means on said connected links for limiting angular lost motion between said connected links, and means adapted for engaging a camming surface, means pivotally connecting said linkage and said lever, means pivotally connecting said linkage and said rocker arm, and a stationary camming plate on said frame, said plate including a camming surface engaged by said means adapted for engagement thereof and comprising means for displacing said means pivotally connecting said rocker arm and said linkage about said means pivotally mounting said rocker arm to thereby rock said rocker arm in response to post initial movement in said one direction by said control lever of said means pivotally connecting said linkage and said lever.

3. A single lever control comprising a housing, a control lever, means pivotally mounting said control lever on said housing, a rocker arm adapted to be connected to the throttle of an engine, means pivotally mounting said rocker arm on said housing to vary the setting of the engine throttle in response to rocker arm movement, a linkage comprising a first link, a second link, means pivotally connecting a first point on said first link and said lever, means pivotally connecting a second point on said first link and a first point on said second link, means pivotally connecting a second point on said second link and said rocker arm, means on said first and second links for limiting angular movement therebetween, and means on said linkage adapted for engaging a camming surface, and a stationary camming plate on said housing, said plate including a camming surface engaged by said means on said linkage and comprising means for displacing said means pivotally connecting said rocker arm and said second link about said means pivotally mounting said rocker arm to thereby rock said rocker arm in response to displacement by said control lever of said means pivotally connecting said first link and said lever.

4. A single lever control comprising a housing, a control lever, means pivotally mounting said control lever on said housing for movement from a neutral setting, means connected to said control lever and adapted to be connected to the clutch of an engine for actuation thereof in response to initial movement of said lever from said neutral setting, a rocker arm adapted to be connected to the throttle of an engine, means pivotally mounting said rocker arm on said housing to vary the setting of the engine throttle in response to rocker arm movement, a linkage comprising a first link, a second link, means pivotally connecting one end of said first link and said lever, means pivotally connecting the other end of said first link and a point intermediate the ends of said second link, means pivotally connecting said rocker arm and the end of said second link remote from said first link, means on said first link intermediate the ends thereof and on the other end of said second link for limiting angular movement between said links, and means on said linkage coaxial with said means pivotally connecting said first and second links and adapted for engaging a camming surface, and a stationary camming plate on said housing, said plate including a hyperbolically shaped camming surface engaged by said last mentioned means on said linkage and comprising means for guiding displacement of said means pivotally connecting said rocker arm and said second link about said means pivotally mounting said rocker arm to thereby rock said rocker arm in response to post-initial movement by said control lever of said means pivotally connecting said linkage and said lever.

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