Jan. 5, 1960 J. F. MORSE 2,919,772

THROTTLE OPERATING CAM MECHANISM FOR SINGLE LEVER CONTROL

Filed Aug. 25, 1958 4 Sheets-Sheet 1

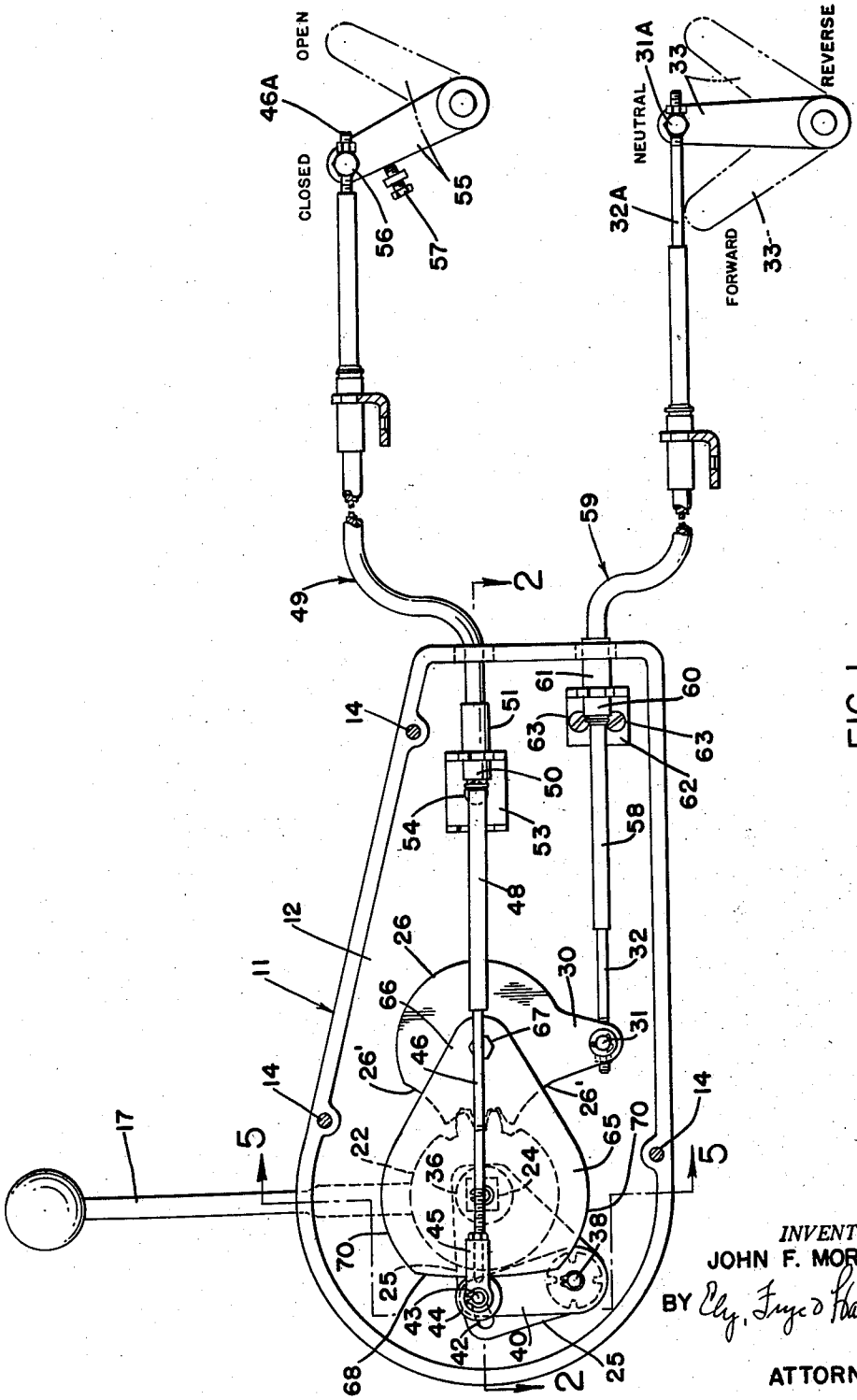



FIG. 1

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Filed Aug. 25, 1958 4 Sheets-Sheet 2

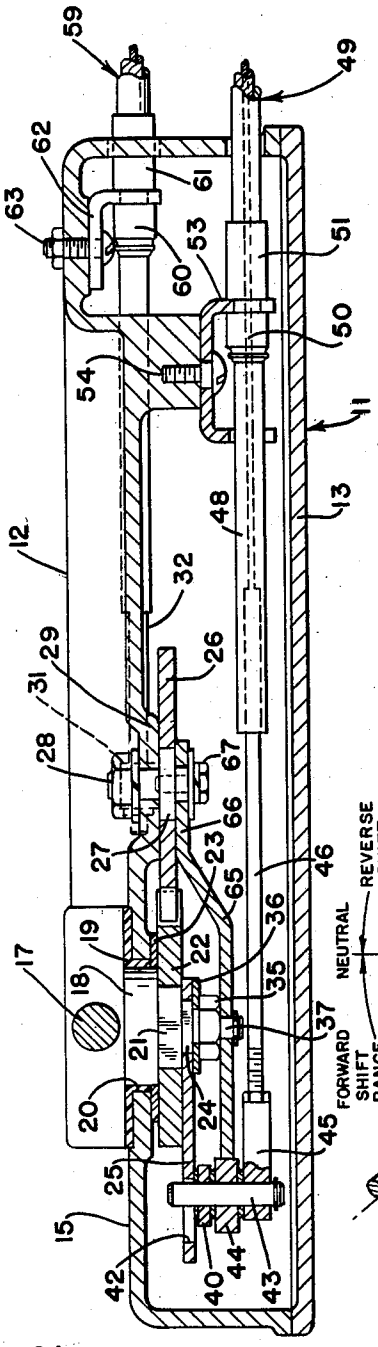


FIG. 2

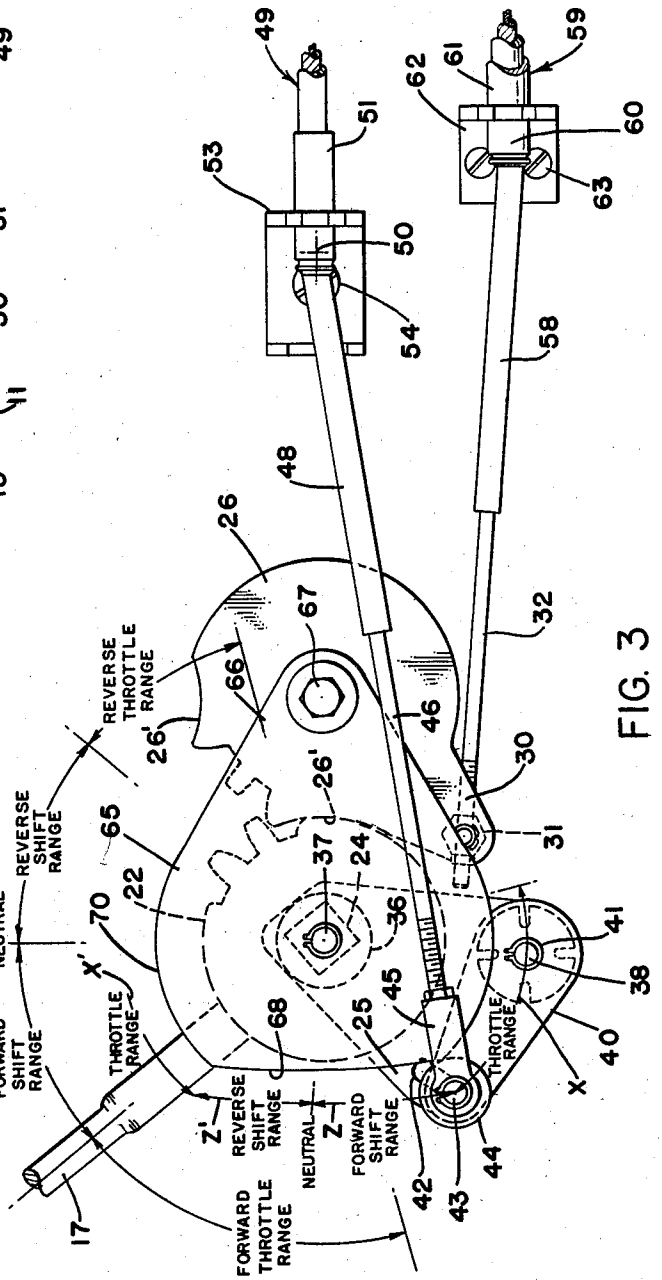



FIG. 3

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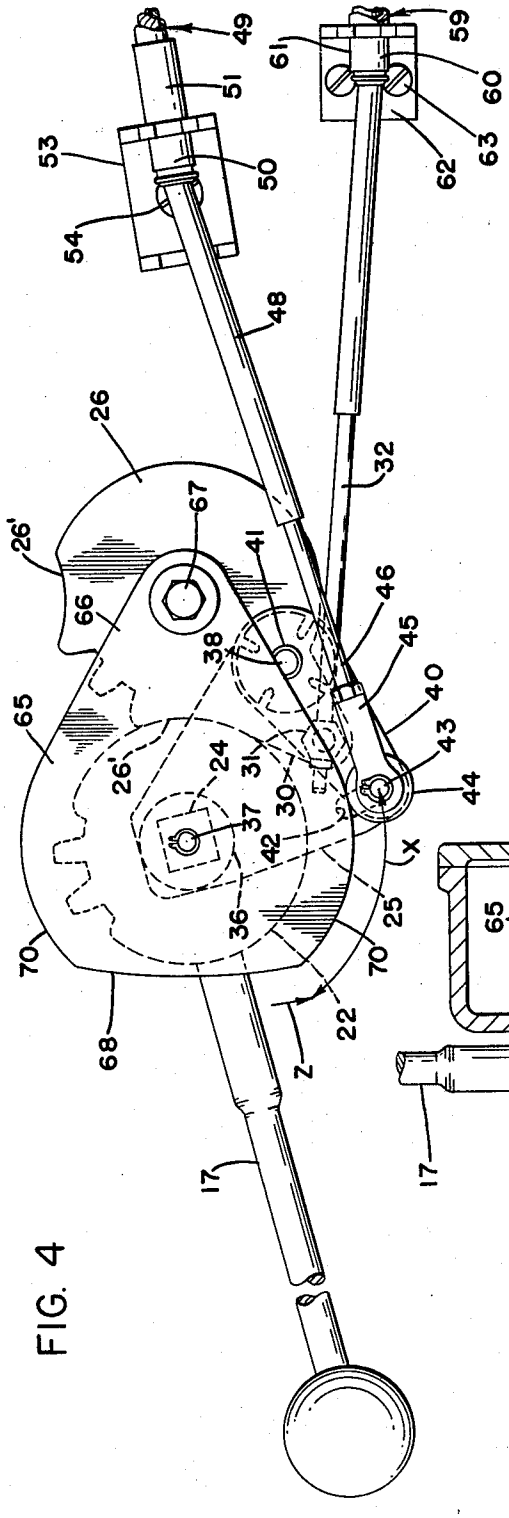



FIG. 4

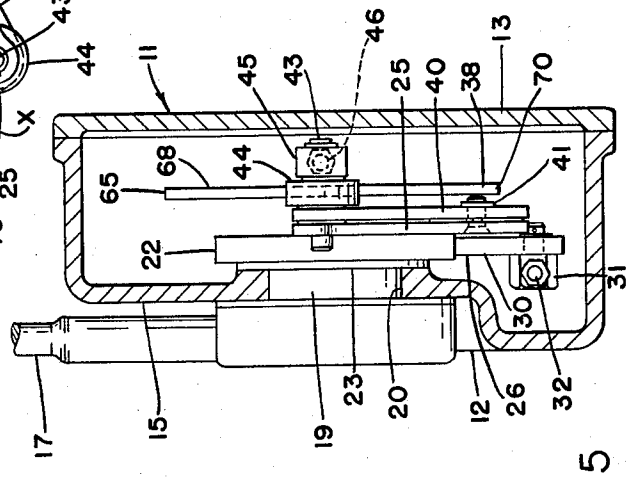



FIG. 5

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THROTTLE OPERATING CAM MECHANISM FOR SINGLE LEVER CONTROL

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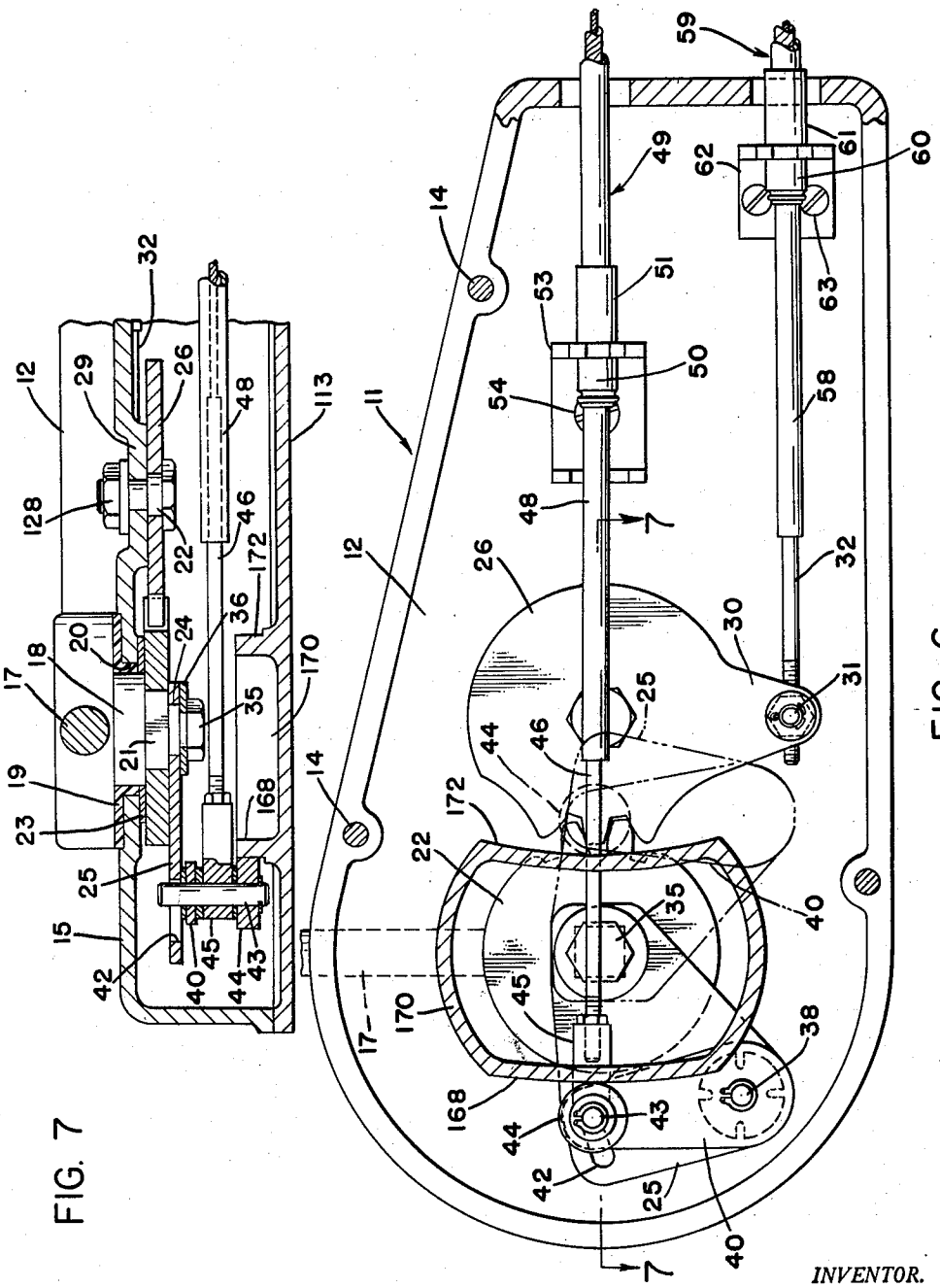


FIG. 6



FIG. 7

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United States Patent Office 2,919,772 Patented Jan. 5, 1960



2,919,772

# THROTTLE OPERATING CAM MECHANISM FOR SINGLE LEVER CONTROL

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Application August 25, 1958, Serial No. 757,031

12 Claims. (Cl. 192—.096)

The invention relates generally to single lever control units for operating both the clutch and throttle of an internal combustion engine or other mechanism requiring sequencing controls. More particularly, the invention relates to an improved mechanism for operating the throttle of a marine engine in such manner as to eliminate throttle movement during the initial movement from neutral of the control lever, which is required to engage the engine clutch.

In certain types of single lever controls for marine engines, the clutch and throttle control arms are operatively connected by mechanism such as intermittent or interrupted gears so that movement of the control lever in either direction first engages the clutch, and then advances the throttle as the boat moves in either direction. The clutch and throttle control arms are connected to the engine clutch and throttle by linkages which may comprise push-pull cables, and as the control lever is rotated the control arms swing on arcs around their centers of rotation.

This arcuate movement of the throttle control arm during clutch engagement results in some displacement of the linkage attached thereto, and while the backlash in the push-pull cable system absorbs some of the displacement, a slight advance of the engine throttle may still take place as the clutch is being engaged, and the engine cannot be driven at minimum forward or reverse speeds substantially at or slightly above idling speed.

Various mechanisms have been proposed for eliminating or minimizing the throttle advance during clutch engagement in a single lever control, but most of these mechanisms have been complicated and relatively expensive.

The purpose of the present invention is to provide an improved single lever control for operating a marine engine at minimum forward and reverse 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 mechanism for eliminating any advance of the engine throttle as the control lever is moved through the forward and reverse shifting range.

These and other objects are accomplished by the improvements comprising the present invention, a preferred embodiment of which is shown by way of example in the accompanying drawings and described in detail herein. Various modifications and changes in details of construction are comprehended within the scope of the invention as defined in the appended claims.

Referring to the drawings:

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

Fig. 2 is an enlarged plan sectional view as on line 2—2 of Fig. 1.

Fig. 3 is an enlarged schematic view similar to Fig. 1, showing the control lever at the end of the forward shift range to fully engage the engine clutch.



Fig. 4 is a view similar to Fig. 3, showing the control lever in full forward position to advance the throttle to full open position with the clutch engaged in forward.

Fig. 5 is a vertical sectional view on line 5—5 of Fig. 1.

Fig. 6 is an enlarged view similar to Fig. 1 showing a modified throttle operating cam mechanism.

Fig. 7 is a horizontal sectional view on line 7—7 of Fig. 6.

A throttle control gear member on the shaft of the control member meshes with a clutch control gear member in such manner that the clutch control gear member rotates only during the first portion of the rotation of the throttle control gear member in forward or reverse direction from neutral. The present invention provides a cam and linkage mechanism for swinging the throttle connector on an elongated radius during rotation of the clutch control gear member, and for swinging the throttle connector on a shortened radius about the axis of the throttle control gear member after the clutch control gear member has stopped rotating.

The control unit has a housing indicated as a whole at **11**, comprising a peripherally flanged face plate **12** and a cover plate **13** held together by bolts **14** passing through registering countersunk holes in both plates. Suitable means (not shown) may be provided for attaching the housing to a control station or to a mounting pad on the side of the boat.

As shown in Figs. 2 and 5, the front plate **12** may have a recessed front wall portion **15**, and the control lever **17** has a hub shaft **18** journaled in a bushing **19** in an opening **20** in the forward portion of wall **15**, so that the control lever can swing within the recessed portion of the front plate. The shaft **18** is provided inwardly of its journal with a squared portion **21** on which the throttle control gear **22** is keyed, and preferably a bearing washer **23** is interposed between the gear **22** and wall portion **15**. Inwardly of the squared portion **21**, the shaft has a reduced squared portion **24** on which a throttle control lever arm **25** is keyed.

The gear member **22** is an interrupted or mutilated gear which meshes in the neutral position of the control lever with an interrupted or mutilated gear **26** rotatably mounted on the journal portion **27** of a bolt **28** mounted in a boss **29** in wall portion **15** to the rear of and in horizontal alignment with the hub shaft **18** of control lever **17**. The gear **26** is provided with a lever arm projection **30** which carries a swivel connector **31** connected to the end of a clutch control push rod **32**, for operating the engine clutch lever **33** as the gear **22** is rotated by the control lever.

The gear members **22** and **26** may have the same pitch as shown and are meshed for approximately 45° rotation in either direction from the neutral position of Fig. 1, so that rotation of gear **22** about 40°–45° rotates the gear **26** in opposite direction substantially the same amount. Beyond 45°, the gears become unmeshed and gear **22** can be rotated further to advance the engine throttle, while one of the arcuate faces **26'** on gear **26** slidably engages the circular edge on gear **22** so that the clutch control gear remains stationary.

The relative pitches of the gears **22** and **26** may vary as desired, and other well-known mechanism, such as Geneva mechanisms, may be substituted for gears **22** and **26** to obtain similar relative movement of the engine clutch and throttle control linkages.

Rotation of the control lever in either direction from neutral rotates the gear **22** and the throttle control lever arm **25**. The arm **25** may be substantially triangular in shape, the inner corner being held on the squared portion **24** of the shaft by a nut **35** and washer **36**. The inner reduced end **37** of shaft **18** projects beyond the nut **35** and provides a pin bearing for a purpose to be described.

One outer corner of arm 25 has a pivot pin 38 therein on which a lever arm 40 is pivoted at one end and held on the pin by a snap ring 41. The other outer corner of arm 25 has an arcuate slot 42 therein, curved about pin 38 as a center, and a pivot pin 43 in the other end of arm 40 extends through the slot. The pin 43 has a roller 44 journaled thereon on the rear side of arm 40 and the rear end of the pin 43 carries the swivel connector 45 for the throttle control push rod 46.

The push rod 46 telescopes within a sleeve 48 and is connected to the core of a push-pull cable indicated generally at 49. The opposite end of sleeve 48 has a pivot connection at 50 in one end of a bushing 51, the other end of which is secured to the end of the casing of cable 49. The bushing 51 is preferably mounted in a U-shaped bracket 53 pivotally mounted by bolt 54 on the housing plate 12. The mounting bracket 53 permits maximum deflection of the cable without causing excessive friction or binding of the cable core, and the construction and operation thereof is disclosed and claimed in my copending application Serial No. 739,711, filed June 4, 1958.

As shown in Fig. 1, the push-pull cable 49 may be connected at its remote end to the throttle lever 55 of the engine by a similar push rod 46A attached to a swivel connector 56 on the throttle lever. A stop 57 on the engine holds the lever 55 at idling speed when the control lever 17 is in neutral.

The clutch control push rod 32 connected to gear 26 telescopes within a sleeve 58 and is connected to the core of a push-pull cable indicated generally at 59. The opposite end of sleeve 58 has a pivot connection at 60 within one end of a bushing 61, the other end of which is secured to the end of the casing of cable 59. The bushing is preferably mounted in an L-shaped bracket 62 secured to the housing plate 12 by screws 63. The cable 59 may be connected at its remote end to the clutch lever 33 of the engine by a similar push rod 32A attached to a swivel connector 31A on the clutch lever.

The pivot pin 37 on the end of shaft 18 provides a central mounting for a cam plate 65 having a laterally offset tail portion 66 rigidly secured to the end of mounting bolt 28 by a stud 67 screwed into the inner end of the bolt. The forward edge 68 of the cam plate is curved on an arc substantially about the pivot 50 of the sleeve 48 as a center, eccentric of the shaft 18, and the main body of cam plate 65 is in the same plane as cam roller 44 with the roller engaging the edge 68 of the plate.

Thus, as the control lever is rotated forwardly from neutral through about 40° the roller 44 and swivel connector 45 swing on the long radius of arc Z about the center 50, and as the lever is rotated from neutral about 40° in reverse, the roller swings on the same radius on arc Z'. During this 40° of rotation in either direction the stop 57 on the engine or other suitable limiting means holds the throttle at idling speed, and the pin 43 moves from the inner end to the outer end of the slot 42 as the arm 40 pivots on pin 38, thus allowing the roller to follow the cam edge 68 as the lever arm 25 rotates about the axis of shaft 18. Consequently, there will be no displacement of the push rod 46 and no advance of the throttle during movement of 40° in either direction of the control lever, while the gears 22 and 26 are in mesh and the shifting of clutch lever 33 is being completed.

When the control lever is moved beyond the clutch shifting range in either direction, the cam roller rolls on the concentric edge 70 of the cam with the pin 43 held in the outer end of slot 42, as seen in Fig. 4, so that the pin follows the arc of reduced radius X or $X^1$ having pin 37 as its center, and the push rod 46 is displaced to advance the throttle lever 33.

The mechanism shown in Figs. 1–5 is adapted to operate a push-open throttle, and to operate a pull-open throttle the arm 25 would be positioned 180° from the position shown in Fig. 1 in neutral, so that the cam roller would be on the opposite side of shaft 18 and pin 37.



This would require a diametrically opposite concave cam edge on plate 65, curved on a radius about pivot 50 as a center on which the roller would roll during the 40° rotation from neutral of the control lever in either direction.

In the modified form shown in Figs. 6 and 7, the cam plate is replaced by cam ribs 168 and 170 preferably formed on the inner surface of cover plate 113. For a push-open throttle the convex rib 168 curved about the pivot 50 as a center causes the roller 44 to follow the long radius during 40° of rotation from neutral in either direction, and the ribs 170 concentric with the axis of shaft 18 engage the cam roller beyond the 40° point and cause it to follow the short radius. In this construction the roller is placed to the rear of the swivel connector 45 on pin 43, and the mountings 37 and 67 for the cam plate are not needed.

For a pull-open throttle, a concave cam rib 172 is provided on cover plate 113 on the opposite side of shaft 18, and the arm 25 and cam roller 44 reversed through 180° as indicated in dotted lines in Fig. 6.

What is claimed is:

1. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm on said first rotatable member, a lever pivoted on said arm carrying a pin, said arm having an arcuate slot receiving said pin to allow limited movement of said lever, a cam roller on said pin, a throttle connector swiveled on said pin, and a stationary cam element in said housing engaging said roller to cause said throttle connector to swing concentric with said first member when said first member has been rotated out of cooperative engagement with said second member, and to swing on a relatively long radius when said first member is rotated in cooperative engagement with said second member.

2. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm projecting radially of said first rotatable member, a lever pivoted on said arm for limited swinging movement, a roller journaled on said lever, a throttle connector carried by said arm, and a stationary cam element in said housing engaging said roller to cause said throttle connector to swing concentric with said first member when it has been rotated out of cooperative engagement with said second member, and to swing eccentric of said first member on a relatively long radius when said first member is rotated in cooperative engagement with said second member.

3. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm on said first rotatable member, a lever pivoted on said arm carrying a pin, said arm having an arcuate slot receiving said pin to allow limited movement of said lever, a cam roller on said pin, a throttle connector swiveled on said pin, a push rod assembly connected at one end to the throttle connector and having a pivotal connection at its other end with the throttle control mechanism, and a stationary cam element in said housing engaging said roller to cause said

throttle connector to swing concentric with said first member to displace the push rod when said first member has been rotated out of cooperative engagement with said second member, and to swing said push rod assembly about its pivotal connection as a center when said first member is rotated in cooperative engagement with said second member.

4. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm projecting radially of said first rotatable member, a lever pivoted on said arm for limited swinging movement, a roller journaled on said lever, a throttle connector carried by said arm, a push rod assembly connected at one end to the throttle connector and having a pivotal connection at its other end with the throttle control mechanism, and a stationary cam element in said housing engaging said roller to cause said throttle connector to swing concentric with said first member to displace the push rod when said first member has been rotated out of cooperate engagement with said second member, and to swing said push rod assembly about its pivotal connection as a center when said first member is rotated in cooperative engagement with said second member.

5. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm on said first rotatable member, a lever pivoted on said arm carrying a pin, said arm having an arcuate slot receiving said pin to allow limited movement of said lever, a cam roller on said pin, a throttle connector swiveled on said pin, and a stationary cam plate in said housing having a curved surface concentric with said first member engaging said roller when said first member has been rotated out of engagement with said second member, and having a surface curved on a relatively long radius engaging said roller when said first and second members are in cooperative engagement.

6. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm projecting radially of said first rotatable member, a lever pivoted on said arm for limited swinging movement, a roller journaled on said lever, a throttle connector carried by said arm, and a stationary cam plate in said housing having a curved surface concentric with said first member engaging said roller when said first member has been rotated out of engagement with said second member, and having a surface curved on a relatively long radius engaging said roller when said first and second members are in cooperative engagement.

7. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm on said first rotatable member, a lever pivoted on said arm carrying a pin, said arm having an arcuate slot receiving said pin to allow limited movement of said lever, a cam roller on said pin, a throttle connector swiveled on said pin, a push rod assembly connected at one end to the throttle connector and having a pivotal connection at its other end with the throttle control mechanism, and a stationary cam plate in said housing having a curved surface concentric with said first member engaging said roller when said first member has been rotated out of engagement with said second member, and having a surface curved on a relatively long radius about said pivotal connection as a center when said first member is rotated in cooperative engagement with said second member.

8. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm projecting radially of said first rotatable member, a lever pivoted on said arm for limited swinging movement, a roller journaled on said lever, a throttle connector carried by said arm, a push rod assembly connected at one end to the throttle connector and having a pivotal connection at its other end with the throttle control mechanism, and a stationary cam plate in said housing having a curved surface concentric with said first member engaging said roller when said first member has been rotated out of engagement with said second member, and having a surface curved on a relatively long radius about said pivotal connection as a center when said first member is rotated in cooperative engagement with said second member.

9. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member having a shaft mounted in said housing and actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first rotatable member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm on said first rotatable member, a lever pivoted on said arm carrying a pin, said arm having an arcuate slot receiving the pin to allow limited movement of said lever, a cam roller on said pin, a throttle connector swiveled on said pin, and a stationary plate mounted on the shaft of said first rotatable member, said plate having a curved surface concentric with said shaft to engage said roller when said first member has been rotated out of engagement with said second member, and having a surface curved on a relatively long radius to engage said roller when said first and second members are in cooperative engagement.

10. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member having a shaft mounted in said housing and actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first rotatable member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm projecting radially of said first member, a lever pivoted on said arm for limited swinging movement, a roller journaled on said lever, a throttle connector carried by said arm, and a stationary plate mounted on the shaft of said first rotatable member, said plate having a curved surface concentric with said shaft to engage said roller when said first member has been rotated out of engagement with said second member, and having a surface curved on a relatively long radius to engage said roller when said first and second members are in cooperative engagement.

11. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm on said first rotatable member, a lever pivoted on said arm carrying a pin, said arm having an arcuate slot receiving said pin to allow limited movement of said lever, a cam roller on said pin, a throttle connector swiveled on said pin, and a curved cam surface on said housing, said cam surface having a portion concentric with said first member engaging said roller when said first member has been rotated out of engagement with said second member, and having a portion curved on a relatively long radius engaging said roller when said first and second members are in cooperative engagement.



12. In a single lever control unit for the throttle and clutch of an engine, said unit having a housing, a first rotatable member actuated by the lever for throttle control, a second rotatable member for clutch control connected to said first member for cooperative rotation only during the first portion of movement of the control lever in either direction from neutral, the improvement comprising an arm projecting radially of said first rotatable member, a lever pivoted on said arm for limited swinging movement, a roller journaled on said lever, a throttle connector carried by said arm, and a curved cam surface on said housing, said cam surface having a portion concentric with said first member engaging said roller when said first member has been rotated out of engagement with said second member, and having a portion curved on a relatively long radius engaging said roller when said first and second members are in cooperative engagement.

No references cited.