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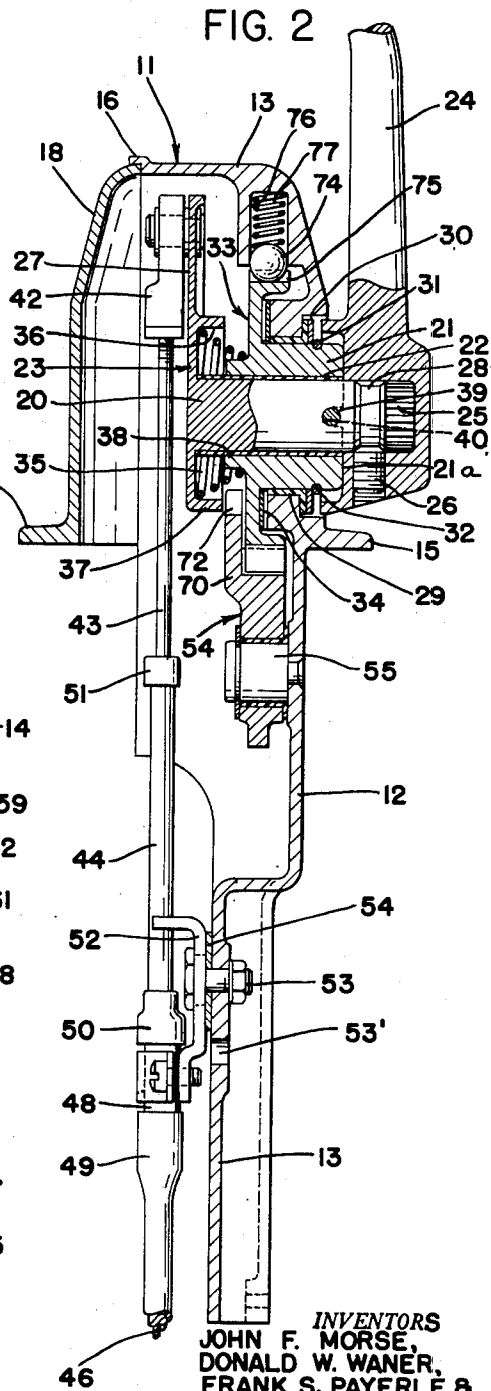
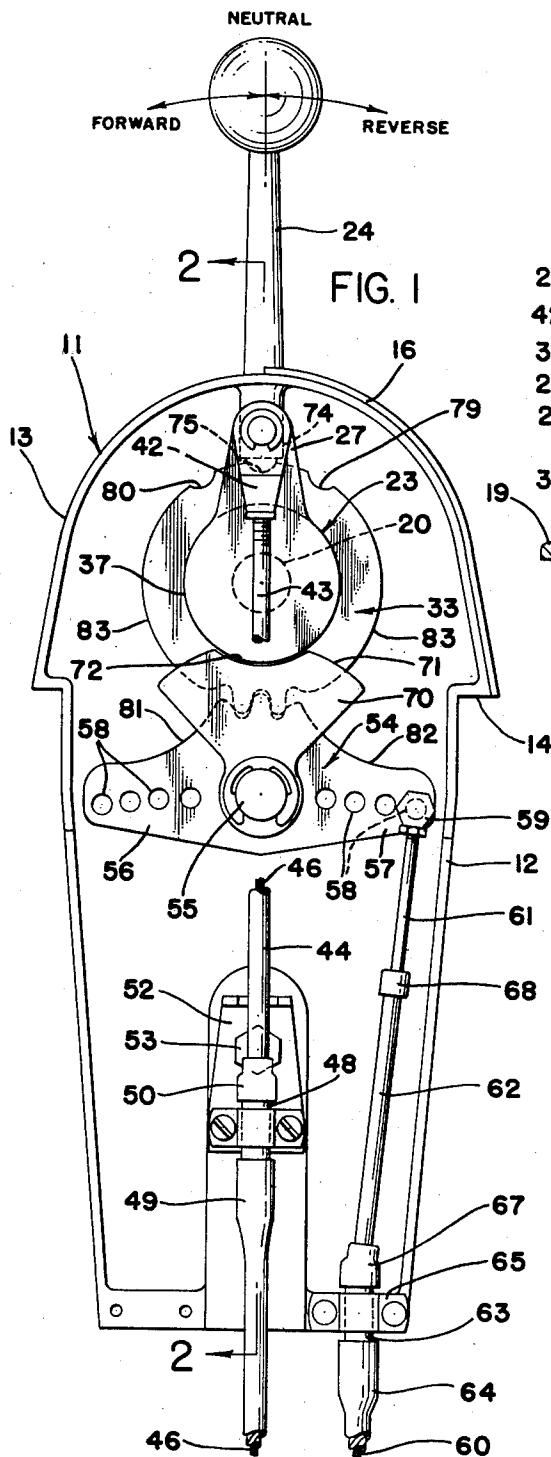
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SINGLE LEVER ENGINE AND IDLE CONTROL

Filed Aug. 22, 1960

2 Sheets-Sheet 1



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FIG. 3

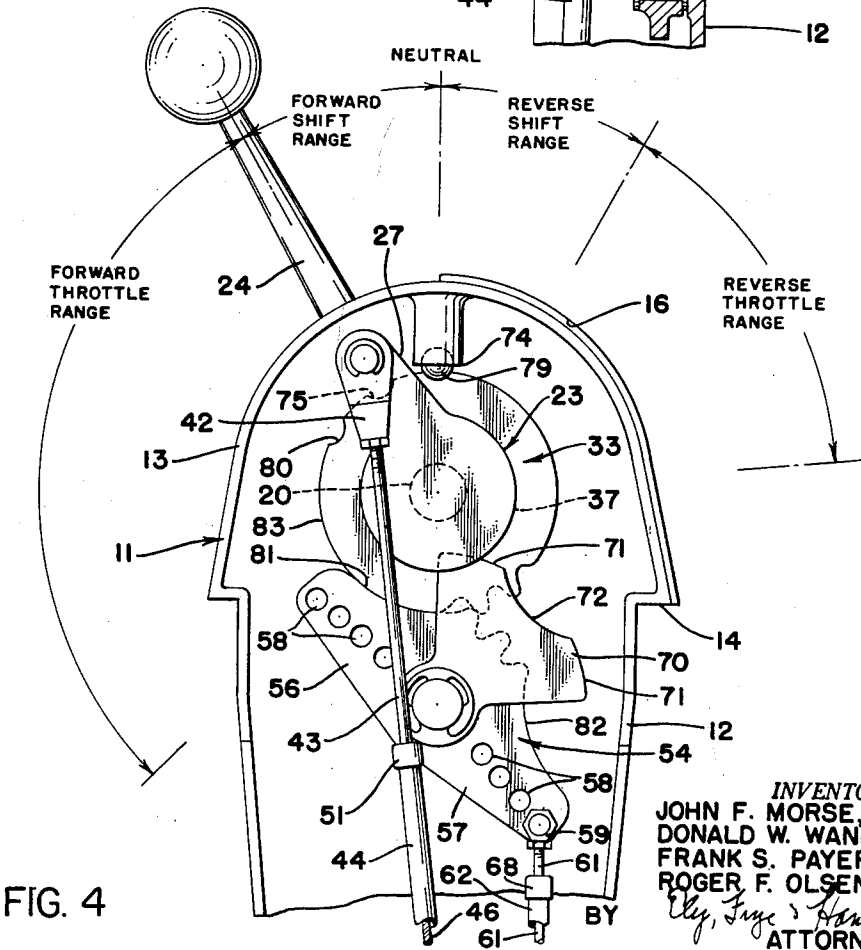
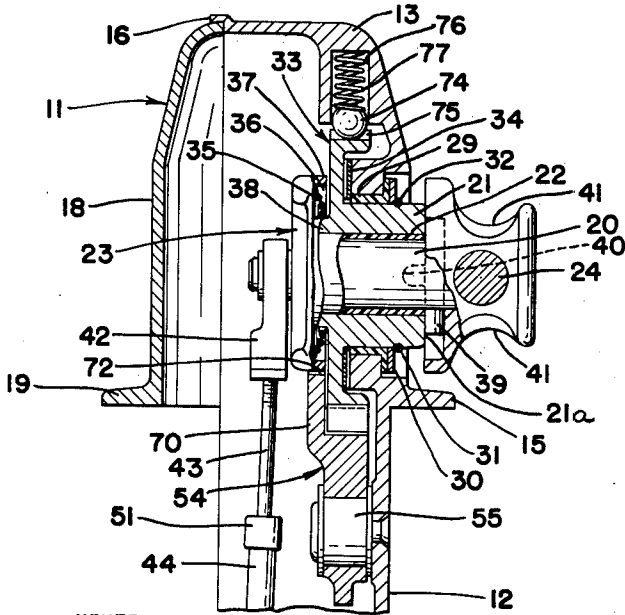


FIG. 4

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SINGLE LEVER ENGINE AND IDLE CONTROL

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10 Claims. (Cl. 74-472)

The present invention relates to an improved control mechanism. More particularly the invention relates to a control unit having a single lever for controlling the clutch and throttle of an internal combustion engine. Specifically, the invention relates to a single lever control for operating the clutch and throttle in co-ordinated unison but adapted selectively to operate the throttle alone.

Single lever control units for the operation of marine engines are of immeasurable assistance to the inexperienced helmsman. The co-ordination of the clutch and throttle controls is most appreciated in emergencies when improper timing in their operation could cause racing of the engine prior proper engagement of the clutch with attendant internal damage to the gearing, or stalling of the engine with exterior damage to the boat.

However, it is also desirable, and often necessary, to provide a means for operation of the throttle independently of the operation of the clutch to accelerate the engine when the clutch is in neutral. Such a means is especially desirable in starting and warming up the engine, or operating generators, compressors, pumps, etc. from the main power plant when the boat is anchored.

Other known means for independent throttle operation have utilized oscillation of the control lever transversely of its normal direction of operation or have required additional or auxiliary control levers. These prior art auxiliary throttle control means have required complicated interior mechanisms in the control unit; have required that both the control cable and its core be freely suspended for independent action; have required complex interlocking to prevent engaging the clutch prior to closing the throttle; and, have permitted only limited range of auxiliary throttle control.

It is therefore the primary object of the present invention to provide a single lever control unit for co-ordinated control of the throttle and clutch which is adapted selectively to control the throttle independently of the clutch by initial lateral translation of the control lever in neutral position and subsequent arcuate movement of the control lever through its normal range without complicated additional mechanism or specially mounted control cables.

It is a further object of the present invention to provide an interlocking mechanism for a control unit of this type which prevents disengaging the control lever from the clutch control when the clutch is engaged and prevents engaging the clutch when the throttle is advanced.

It is a further object of the present invention to provide a control unit of this type in which the control lever automatically re-engages the clutch control when the control lever is returned to neutral position.

It is a still further object of the invention to provide a self-contained control unit of extremely thin construction adapted to be easily paired with a like unit for controlling twin engines with one hand.

These and other objects which will become apparent to

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the reader of the following specification are accomplished by means hereinafter described and claimed.

One preferred embodiment is shown by way of example in the accompanying drawings and hereinafter described in detail without attempting to show all of the various forms and modifications in which the invention might be embodied; the invention being measured by the appended claims and not by the details of this specification.

In the present invention the arcuate motion of the control lever normally provides co-ordinated control of the throttle and clutch controls through the entire range of operation. In addition, the control lever in neutral position is adapted to be translated outwardly from the control housing to disengage the clutch actuating means and permit independent operation of the throttle by normal arcuate movement of the lever through the throttle range. Positive inter-locks are provided so that this neutral throttle action can be moved either in or out of engagement only at neutral position. This permits operation of the throttle alone while the clutch remains locked in neutral. When the control lever is returned to idle at neutral it is automatically translated inwardly to re-engage the clutch actuating means for normal single lever operation.

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 cross section taken substantially on line 2-2 of FIG. 1;

FIG. 3 is a fragmentary area of FIG. 2 in section showing the control lever disengaged from the clutch control and arcuately swung for independent operation of the throttle; and,

FIG. 4 is a fragmentary view similar to FIG. 1 with the control lever moved to engage the clutch in forward shift position.

Referring now to FIGS. 1 and 2, the control unit has a housing indicated generally by the numeral 11. The lower portion 12 of housing 11 is recessed inwardly of the upper portion 13 to form a shoulder 14 along their juncture. A flange 15 is provided across the front of portion 13 adjacent shoulder 14 by which the unit may be secured in top mounted disposition, by means not shown. An offset lip 16 extends rearwardly from not more than one-half of the rear edge of upper portion 13 which is adapted to embrace a portion of the edge of rear cover plate 18 which is also provided with a mounting flange 19 similar to flange 15. The open rear of housing 11 and its lip 16 is also adapted to mate with a similar housing in which the movement of the control is of opposite hand (not shown) for twin control mounting.

A control shaft 20 extends laterally through the upper portion 13 of housing 11 and is journaled in a drive hub 21 which in turn is journaled in the upper portion 13 of housing 11. A sleeve bearing 22 is preferably interposed between shaft 20 and drive hub 21. An inner circular throttle hub 23, from which a throttle arm 27 radially extends, may be integrally formed with the axially inner end of shaft 20 to rotate therewith. The axially outer end of shaft 20 is adapted to mount control lever 24. The control lever 24 has a socket attached to the shaft 20 by the serrations 25 and a set screw 26 is received in annular groove 28 on shaft 20. This allows selective positioning of control lever 24 to provide the most suitable

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operating quadrants, and also allows neutral positioning of the throttle control arm 27 selectively to accommodate either "push-to-open" or "pull-to-open" throttle actions, as will be more fully described.

A flanged sleeve bearing 29 between drive hub 21 and housing 11 accomplishes the journaling of drive hub 21 in the housing. A thrust washer 30 abuts sleeve bearing 29 and is positioned by a snap ring 31 which seats in annular groove 32 on drive hub 21, exteriorly of housing 11. An interruptedly or intermittently geared drive member 33 extends radially outwardly from drive hub 21 on the axially opposite side of the journaled portion thereof, interiorly of housing 11. A spring washer 34 is preferably positioned between drive member 33 and the interior of housing 11 to provide a braking friction to the rotation of hub 21. This is especially desirable if the unit is subjected to vibration or if the mechanisms being operated are in any way spring loaded, as would be the case if a spring governor were provided on the throttle.

A helical spring 35 is retained within a circular recess 36 circumscribed by an annular shoulder 37 extending from throttle hub 23, and surrounds an extension 38 of drive hub 21. Spring 35 continually urges the throttle and drive hubs 23 and 21 apart. A pin 39 is pressed through shaft 20 so as to be held within the notch 40 across the axially outer edge 21a of hub 21 by the action of spring 35. Pin 39 thereby interconnects shaft 20 and drive hub 21 to accomplish normally simultaneous rotation of both shafts 20 and drive member 33 upon actuation of control lever 24.

Grip recesses 41 (FIG. 3) are preferably provided on control lever 24 to aid the operator in translating or shifting the control lever 24 axially outwardly of housing 11, thereby axially sliding shaft 20 through drive hub 21 against the compression of spring 35 to disengage pin 39 from notch 40. In this outwardly translated position, rotation of control lever 24 accomplishes rotation of shaft 20 without the attendant rotation of hub 21. The compression of spring 35 snaps the pin 39 into re-engagement with notch 40 when they are re-aligned.

The outer end of throttle arm 27 has a swivel connection 42 with the end of a push rod 43 which telescopes within a sleeve 44 and is secured, by suitable means not shown, to the end of a push-pull cable 46. The sleeve 44 has a swivel connection with the front end of a mounting bushing 48 secured to the sheath 49 of cable 46. Resilient sealing sleeves 50 and 51 to act as moisture seals are preferably provided at the joint between the bushing 48 and sleeve 44, and around the forward end of the sleeve 44, respectively.

The mounting bushing 48 is secured in a swivel clip 52 pivotally mounted on bolt 53, which secures it to portion 13 of housing 11, the clip acting to mitigate undesirable binding of the control cable. A bearing plate 54 may be provided between swivel clip 52 and housing 11.

It is readily apparent that by rotating shaft 20 to locate the swivel connection 42 on the same side of the shaft 20 as swivel clip 52 when the throttle is in idle position rather than the diametrically opposed disposition shown in FIG. 1, the unit can be easily adapted to operate a "pull-to-open" rather than a "push-to-open" throttle. In such case the pivot bolt 53 would be mounted in the alternate hole 53' (FIG. 2).

In the neutral position (FIG. 1), intermittently geared drive member 33 meshes with an intermittently geared clutch control member 54 mounted for rotation on a stud 55 extending inwardly from lower portion 12 of housing 11. As shown, the teeth on geared clutch control member 54 are preferably on a smaller radius than the teeth on geared drive member 33 so that a 30° rotation of drive member 33 in either direction will rotate clutch control member 54 through 45° in the opposite direction. However, the relative radii of the two geared members may be changed as desired. Geared member 54 is pro-

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vided with two oppositely extending clutch control arms 56 and 57, each of which is provided with a plurality of holes 58 adapted selectively to pivotally receive a swivel connection 59 to which is attached the clutch control cable 60 by push rod 61 which telescopes in sleeve 62 similarly to the operation of cable 46 by push rod 43. Sleeve 62 similarly has a swivel connection with the front end of mounting bushing 63 secured to the sheath 64 of cable 60 and to housing 11 by bracket 65. Resilient sealing means 67 and 68 are similarly provided at the joint between the bushing 63 and sleeve 62, and around the forward end of the sleeve 62, respectively.

Because of the plurality of holes 58, a standard rotation (e.g. 45°) of clutch control member 54 can accommodate the varying degrees of throw required to operate various clutch assemblies, and provide the selected push or pull result against control cable 60 by arcuate movement of control lever 24 in either direction.

Clutch control member 54 also has an axially offset wing plate 70 generally in the shape of a circular sector having its center concentric with stud 55. The circumferential edge 71 of plate 70 is interrupted by an arc extending inwardly of the sector which defines the reverse curved edge 72 thereof. In the neutral or FIG. 1 position, reverse curved edge 72 is concentric with the circular hub 23 and has a radius only slightly larger than circular hub 23, while offset wing plate 70 lies in a plane medially the drive member 33 and shoulder 37 on circular hub 23, as best seen in FIG. 2. The purpose of the particular configuration and planar position of wing plate 70 will be hereinafter more fully described.

Preferably, the control lever 24 is yieldingly held in neutral position by a spring biased ball 74 received in a detent notch 75 in gear plate 33. As shown in FIG. 2 the recess 76, for the spring 77, is integrally formed in upper portion 13 of housing 11.

Normally, when the control lever 24 is rotated 30° from neutral in either direction, the shifting arms 56 or 57 move the swivel connection 59 through 45° in one direction or the other. In this range of movement the push rod 61, and the cable 60 to which it is connected, moves the shifting lever of the engine to which it is connected to fully engage the clutch of the engine in forward or reverse. The corresponding 30° movement of the throttle arm 27 on its arc causes very slight displacement of push rod 43 and cable 46, because the arm 27 and the push rod 43 are swinging in the same general direction on different arcs. This slight displacement of push rod 43 is normally absorbed by the backlash in the cable and in the throttle linkage at the engine, without causing advance of the throttle.

Detent notches 79 and 80 are provided in drive member 33 to receive the spring biased ball 74 in idle forward and idle reverse positions of control lever 24, respectively.

Further arcuate movement of control lever 24 beyond 30° into the forward or reverse throttle range causes sufficient displacement of the control rod 43 to progressively advance the throttle. When the control lever 24 is so rotated beyond this 30° movement in either direction, the teeth on drive member 33 become unmeshed from the teeth on clutch control member 54. However, as shown in FIG. 4, one of the arcuate faces 81 or 82 on clutch control member 54 rotatively engages the circular edge 83 of drive member 33 as it continues to rotate, so that arms 56 and 57 are maintained in their 45° position.

FIG. 4 depicts the idle forward position with spring-biased ball 74 received in detent notch 79. The push rod 61 has been displaced into sleeve 62 to fully operate the clutch; push rod 43 has not been displaced into sleeve 44 to any substantial degree; and arcuate face 81 on clutch control member 54 is rotatably engaged by circular edge 83 of drive member 33. Of particular importance, the sector configuration of wing plate 70 and its proximity to circular hub 23 causes plate 70 to be interposed between circular hub 23 and drive member 33 upon the

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slightest rotation of clutch control member 54 in either direction from its neutral position.

If it is desired to advance the throttle of the engine to start or warm up the engine, or operate various engine driven accessories, the control lever 24 is placed in neutral position. Only in this position is wing plate 70 not interposed between circular hub 23 and drive member 33 in normal operation. The control lever 24 is then translated outwardly from housing 11, as by pulling outwardly against finger grips 41. The resulting axial displacement of shaft 20 compresses spring 35, disengages pin 39 from notch 40 and positions shoulder 37 on circular hub 23 in juxtaposition with reverse curved edge 72 on wing plate 70, as shown in FIG. 3.

The control lever 24 can now be arcuately moved to advance the throttle independently of the clutch. The pin 39 rides on edge 21a of hub 21 and drive member 33 is locked in neutral position by the interaction of shoulder 37 and reverse curved edge 72.

The interpositioning of wing plate 70 between circular hub 23 and drive member 33 at other than the neutral position prevents translation of control lever 24 and the corresponding disengagement of pin 39 from notch 40 at all times except when the control lever 24 is in neutral position. This prevents inadvertent disengagement of the clutch controlling drive member 33 with the clutch in gear. Similarly, the juxtaposition of shoulder 37 and reverse curved edge 72 prevents shifting when the throttle has been advanced and thus protects the forward and reverse gearing from being damaged by operation of the clutch when the engine is above idling speed.

When the control lever is returned to neutral position after independent operation of the throttle, the spring 35 causes pin 39 to snap back into notch 40 and disengages shoulder 37 from reverse curved edge 72 to provide co-ordinated single lever control of the clutch and throttle.

The normal operation of the improved unit by means of the single lever control shifts the clutch into forward or reverse and advances the throttle when the lever is moved beyond the shifting range in either direction. The novel construction of the unit provides for selective operation of the throttle independently of the clutch by movement of the lever in its translated position, and the interlocking mechanism prevents disengaging the control lever from the clutch control when the clutch is engaged and prevents engaging the clutch when the throttle has been independently advanced.

What is claimed is:

1. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and normally operatively connecting the throttle and clutch control members, a throttle control shaft journaled in an axially translatable with respect to said drive member, a control lever attached to and extending laterally from said control shaft, said throttle control member extending laterally from said control shaft, engaging means for selectively connecting said throttle control shaft to said drive member, axial translation of said throttle control shaft disconnecting said engaging means to permit regulation of the throttle independently of the clutch.

2. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and

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clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and normally operatively connecting the throttle and clutch control members, a throttle control shaft journaled in and axially translatable with respect to said drive member, a control lever attached to and extending laterally from said control shaft, said control lever having a neutral position, said throttle control member extending laterally from said control shaft, engaging means for selectively connecting said throttle control shaft to said drive member, axial translation of said throttle control shaft disconnecting said engaging means to permit regulation of the throttle independently of the clutch, and means to prevent axial translation of said control shaft except when said control lever is in neutral position.

3. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and normally operatively connecting the throttle and clutch control members, a throttle control shaft journaled in and axially translatable with respect to said drive member, said throttle control member extending laterally from said control shaft, engaging means for selectively connecting said throttle control shaft to said drive member, axial translation of said throttle control shaft disconnecting said engaging means to permit regulation of the throttle independently of the clutch, and means to prevent rotation of said clutch control member when said control shaft is disconnected from said drive member.

4. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and normally operatively connecting the throttle and clutch control members, a throttle control shaft journaled in and axially translatable with respect to said drive member, a control lever attached to and extending laterally from said control shaft, said control lever having a neutral position, said throttle control member extending laterally from said control shaft, engaging means for selectively connecting said throttle control shaft to said drive member, axial translation of said throttle control shaft disconnecting said engaging means to permit regulation of the throttle independently of the clutch, and means to prevent axial translation of said shaft except when said control lever is in neutral position and to prevent rotation of said clutch control lever when said control shaft is disconnected from said drive member.

5. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and normally operatively connecting the throttle and clutch control members, a throttle control shaft journaled in and axially translatable with respect to said drive member, a control lever attached to and extending

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laterally from said control shaft, said control lever having a neutral position, said throttle control member extending laterally from said control shaft, engaging means for selectively connecting said throttle control shaft to said drive member, axial translation of said throttle control shaft disconnecting said engaging means to permit regulation of the throttle independently of the clutch, spring means opposing said translation, and means to prevent axial translation of said shaft except when said control lever is in neutral position and to prevent rotation of said clutch control member when said control shaft is disconnected from said drive member.

6. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and normally operatively connecting the throttle and clutch control members, a throttle control shaft journaled in and axially translatable with respect to said drive member, a control lever attached to and extending laterally from said control shaft, said control lever having a neutral position, said throttle control member extending laterally from said control shaft, engaging means for selectively connecting said throttle control shaft to said drive member, axial translation of said throttle control shaft disconnecting said engaging means to permit regulation of the throttle independently of the clutch, a wing plate rotatably connected with said clutch control member, said wing plate adapted to prevent axial translation of said control shaft except when said control lever is in neutral position and to prevent rotation of said clutch control member when said control shaft is disengaged from said drive member.

7. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and normally operatively connecting the throttle and clutch control members, a throttle control shaft journaled in and axially translatable with respect to said drive member, a control lever attached to and extending laterally from said control shaft, said throttle control member extending laterally from said control shaft, engaging means for selectively connecting said throttle control shaft to said drive member, axial translation of said throttle control shaft disconnecting said engaging means to permit regulation of the throttle independently of the clutch, a wing plate connected to said rotatable clutch control member and lying in a plane adjacent said throttle control member, said wing plate adapted slidably to engage said throttle control member upon outward translation of said control shaft to lock said clutch control member and adapted to abut said throttle control member and prevent translation of said control shaft upon rotation of said clutch control member.

8. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and operatively connected to the clutch control

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member, a notch in said drive member, a throttle control shaft journaled in and axially translatable with respect to said drive member, a pin extending transversely of said throttle control shaft normally received in said notch to connect said drive member to said control shaft, a control lever attached to and extending laterally from said control shaft exteriorly of said housing to rotate and translate said control shaft, said control lever having a neutral position, said throttle control member extending laterally from said control shaft interiorly of said housing, axial translation of said control shaft by lateral translation of said control lever outwardly of said housing disengaging said pin from said notch, a wing plate connected to said clutch control member and lying in a plane offset and adjacent the plane of said throttle control member, said wing plate adapted slidably to engage said throttle member upon outward translation of said control shaft to lock said clutch control member, said wing plate adapted to abut said throttle control member and prevent translation of said throttle control shaft except when said control lever is in neutral position.

9. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a throttle control member, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and operatively connected to the clutch control member, a notch in said drive member, a throttle control shaft journaled in and axially translatable with respect to said drive member, a pin extending transversely of said throttle control shaft normally received in said notch to connect said drive member to said control shaft, a control lever attached to and extending laterally from said control shaft exteriorly of said housing to rotate and translate said control shaft, said control lever having a neutral position, said throttle control member extending laterally from said control shaft interiorly of said housing, axial translation of said control shaft by lateral translation of said control lever outwardly of said housing disengaging said pin from said notch, a wing plate connected to said clutch control member and lying in a plane between said throttle control member and said housing, said wing plate adapted slidably to engage said throttle control member on outward lateral translation of said control lever to lock said clutch control member, said wing plate adapted to interpose between said throttle control member and said housing and prevent lateral translation of said control shaft except when said control lever is in neutral position, and yielding means continuously urging translation of said control shaft inwardly of said housing.

10. In a single lever control unit for opening and closing a throttle and operating a clutch of an engine having a housing, a stud extending inwardly of said housing, a throttle control member rotatably mounted on said stud, a clutch control member operatively connected to said throttle control member for movement only during the first portion of rotation of said throttle control member, said members adapted for operative connection with the throttle and clutch of an engine, the improvement comprising an idle control means comprising, a rotatable drive member journaled in said housing and normally operatively connecting the throttle and clutch control members, a throttle control shaft journaled in and axially translatable with respect to said drive member, a control lever attached to and extending laterally from said control shaft, said throttle control member extending laterally from said control shaft, engaging means for selectively connecting said throttle control shaft to said drive member, axial translation of said throttle control shaft disconnecting said engaging means to permit regulation of the throttle independently of the clutch, a wing plate connected to said

clutch control member and lying in a plane between said throttle control member and said housing, said wing plate of a generally sector-like configuration having a circumferential edge and rotatable about and concentric with the stud mounting said clutch control member, an arcuate reverse curved edge interrupting the circumferential edge, said throttle control member rotatably receivable in juxtaposition with said reverse curved edge upon outward lateral translation of said control lever to lock said clutch control member, the circumferential edge of said wing plate interposing between said throttle control member and said housing to permit outward translation of said

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control lever except when said control lever is in neutral position, and yielding means continuously urging translation of said control lever inwardly of said housing.

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