Dec. 24, 1963 R. G. MARR 3,115,050

CONTROL MECHANISM

Filed Jan. 19, 1962 2 Sheets-Sheet 1

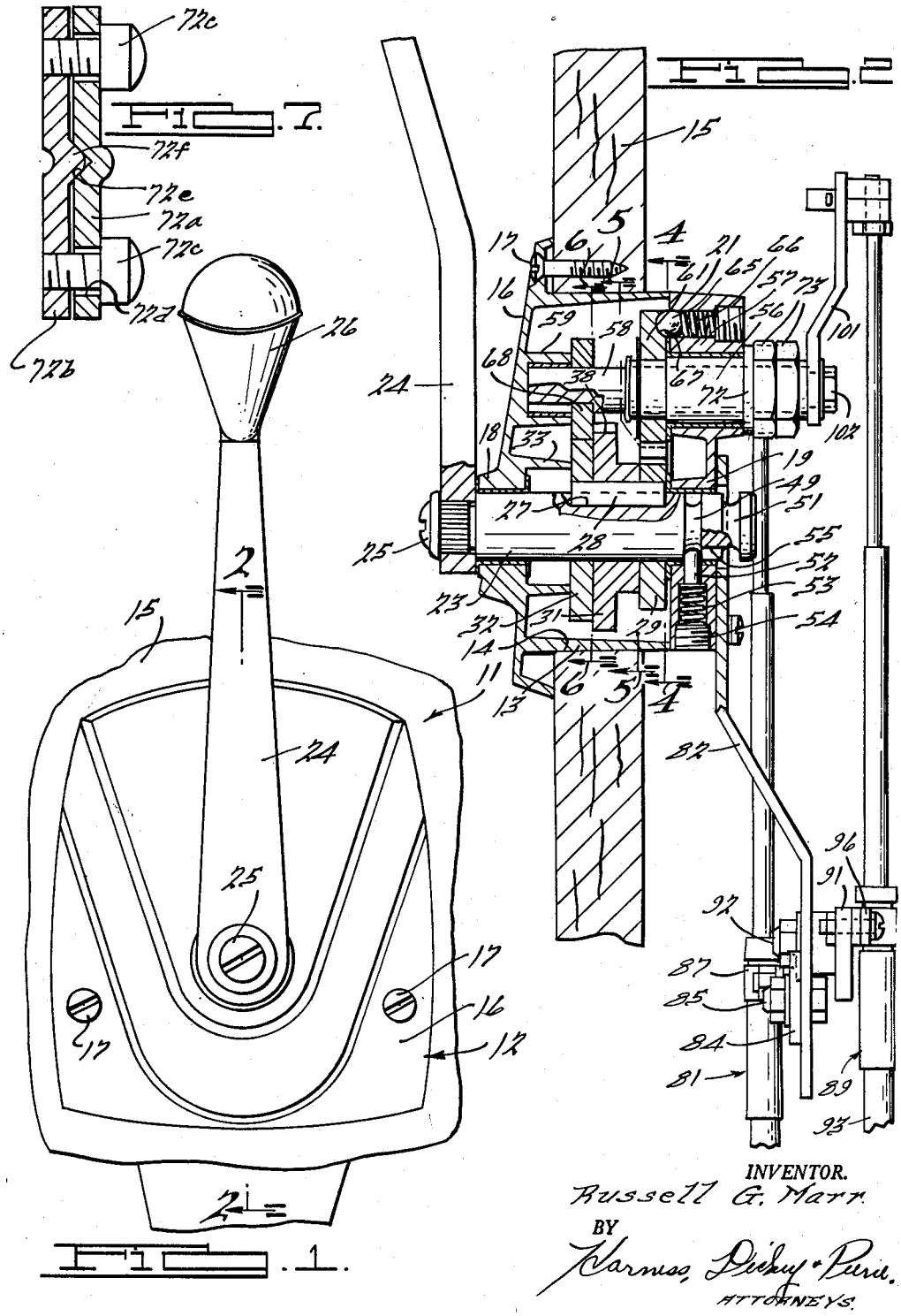


FIG. 1.

FIG. 2.

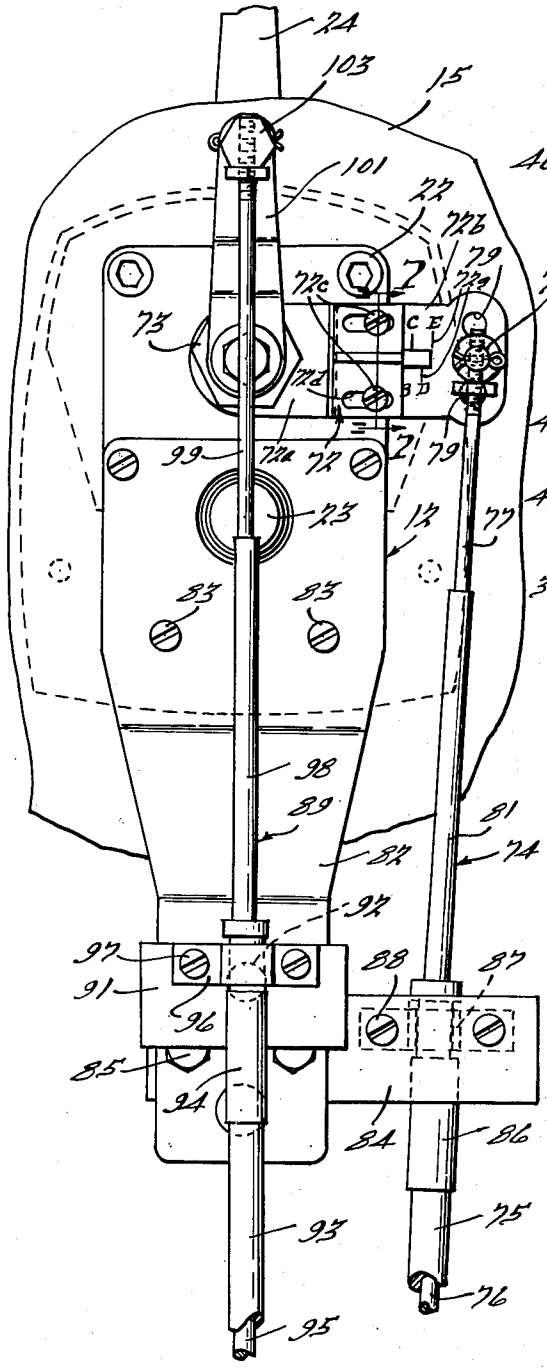
INVENTOR.
Russell G. Marr
BY
Harness, Dickey & Pierce.
ATTORNEYS.

Dec. 24, 1963 R. G. MARR 3,115,050

CONTROL MECHANISM

Filed Jan. 19, 1962 2 Sheets-Sheet 2

Fig. 3.



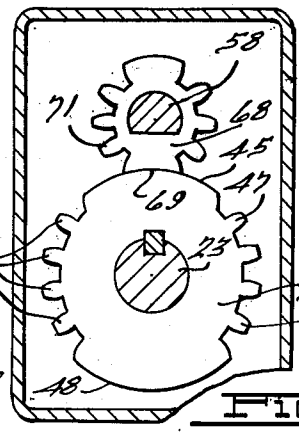


Fig. 5.

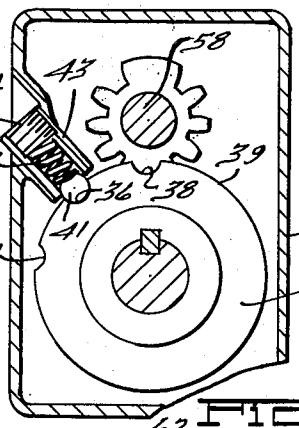


Fig. 6.

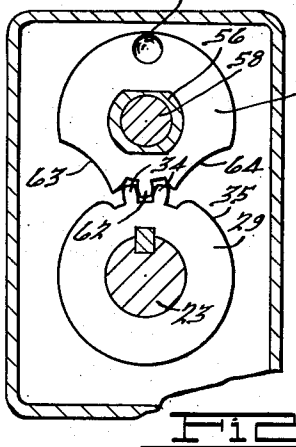


Fig. 4.

INVENTOR.
Russell G. Marr
BY
Harness, Dickey & Pierce
ATTORNEYS

United States Patent Office 3,115,050 Patented Dec. 24, 1963

3,115,050

CONTROL MECHANISM

Russell G. Marr, Detroit, Mich., assignor to Marmac Products Inc., Detroit, Mich., a corporation of Ohio

Filed Jan. 19, 1962, Ser. No. 167,263
11 Claims. (Cl. 74—472)

This invention relates to control mechanism, and more particularly to unitary mechanisms for remotely controlling the reversible transmission and throttle settings of marine engines or the like.

It is an object of the invention to provide a novel and improved marine engine remote control mechanism which permits increased fineness of throttle control at relatively low settings, and at the same time incorporates both throttle and reversible transmission shifting controls in a unitary housing controlled by a single lever.

It is another object to provide an improved single lever marine engine control mechanism of this nature which in one position permits variations in throttle setting while still maintaining the transmission in its neutral position.

It is a further object to provide an improved single lever remote control mechanism for marine engine transmissions and throttles which is of simplified, compact and durable construction, and is adaptable for use with various types of marine engines.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a front elevational view of a preferred embodiment of the invention, showing the housing contours and the location of the control handle;

FIGURE 2 is a cross-sectional view in elevation taken along the line 2—2 of FIGURE 1 and showing the internal mechanism components;

FIGURE 3 is a rear elevational view of the unit showing the cable shifting arms and cable support brackets;

FIGURE 4 is a cross-sectional view in elevation taken along the line 4—4 of FIGURE 2 and showing the components for driving the transmission shifting arm;

FIGURE 5 is a cross-sectional view in elevation taken along the line 5—5 of FIGURE 2 and showing the detent-engaging disc;

FIGURE 6 is a cross-sectional view in elevation taken along the line 6—6 of FIGURE 2 and showing the throttle arm operating components; and

FIGURE 7 is a fragmentary cross-sectional view taken along the line 7—7 of FIGURE 3 and showing the construction of the adjustable transmission control arm.

In general terms, the illustrated embodiment of the invention comprises a housing having a control handle shaft at one end of which is fixed a control handle. The shaft is supported for rotational and axial shifting movements, and a pair of driving elements in the form of interrupted gears are mounted on the shaft, both gears being keyed to the shaft at axially spaced points when the shaft is in its normal axial position. A transmission control shaft and a throttle control shaft are mounted coaxially with each other within the housing and in spaced parallel relation with the control handle shaft. A first driven element in the form of an interrupted gear on the transmission control shaft (referred to as the transmission control driven gear) has teeth meshing with a first interrupted gear (referred to as the transmission control driving gear) on the control handle shaft. A second driven element in the form of an interrupted gear on the throttle control shaft (referred to as the throttle control driven gear) cooperates in turn with the second interrupted gear (referred to as the throttle control driving gear) on the control handle shaft.

The control handle is rotatable in either direction from

an upright neutral or idle position. When in this position, initial rotation in one direction will cause an arm fixed to the transmission control shaft to shift a control cable attached thereto in a direction shifting the transmission either into a forward or reverse position. The arm is of adjustable length, thus permitting variations in the extent of movement of the control cable to accommodate different types of transmissions. After either position has been attained, the teeth on the transmission control driven gear will become separated from the teeth on its driving gear, and a convex surface on the latter will come into contact with one of two concave surfaces on the driven gear, locking the transmission control shaft in its rotated position but permitting further rotation of the control handle shaft. This further rotation will cause separation of a convex surface on the throttle control driving gear from a concave surface on its driven gear, and will bring teeth on these two gears into mesh, so that the throttle control shaft will begin to rotate.

A bracket extends downwardly from the housing and the sheath or outer element of a throttle control cable is secured thereto, the core or inner element of the cable extending upwardly toward the top of the housing. An arm is fixed to the outer end of the throttle control shaft and extends upwardly therefrom when the throttle control shaft is in its idle position, the upper end of this arm having a pivotal connection to the upper end of the cable core. Due to this geometrical relationship between the throttle control arm and the cable, initial rocking movement of the arm in either direction from its idle position will result in relatively little movement of the cable core relative to its sheath. As the shifted angle of the arm increases, however, the increment of cable core movement for each equal increment of angular arm movement will increase, so that at lower speeds the throttle control will be relatively fine, and at higher speeds relatively coarse.

The control handle shaft is axially movable from its normal position described above to a position in which it is unkeyed from the transmission control driving gear, so that rotary movement of the handle will permit variations in throttle adjustment without affecting the transmission. Interlocking means between the housing and control handle shaft are provided for preventing axial movement of the control handle shaft from its normal position to its transmission disconnect position unless the control handle is first placed in its intermediate (neutral or idle) position.

Referring more particularly to the drawings, the control mechanism is generally indicated at 11 and comprises a housing generally indicated at 12 having a wall 13 of generally rectangular shape and adapted to be inserted in an aperture 14 of a support 15, such as a bulkhead on a marine craft. A cover plate 16 is formed integrally with wall 13, housing 12 being secured to support 15 by screws 17 passing through cover plate 16.

A first bearing support 18 is formed on cover plate 16, and a second bearing support 19 aligned with support 18 is formed on an end housing member 21 secured to housing 12 by bolts 22 and enclosing the end of wall 13 which extends through support 15. A control handle shaft 23 is rotatably mounted in bearings 18 and 19 respectively, and a control lever or handle 24 is secured by a fastener 25 to one end of shaft 23 immediately outwardly of bearing 18. The outer portion of handle 24 is inclined slightly outwardly from support 15, and has a knob 26 for convenient grasping, so that the handle may be swung either clockwise or counterclockwise from its intermediate (neutral or idle) position as shown in FIGURE 1.

A keyway 27 is provided in shaft 23, and a key 28 is disposed in this keyway, the key being held against axial movement and rotational movement with respect to the shaft.

A transmission control driving element 29, a detent disc 31, and a throttle control driving element 32 are disposed within housing 12 and surround shaft 23. Driving element 29 is adjacent bearing 19 and driving element 32 is adjacent a boss 33 extending inwardly from bearing 18, detent disc 31 being disposed between elements 29 and 32.

Element 29 comprises an interrupted gear, as seen in FIGURE 4, having two teeth 34 above shaft 23 when handle 24 is in its neutral position, and a convex arcuate surface 35 around the rest of the gear. Detent disc 31 has three notches, 36, 37 and 38, on its outer edge 39, these notches being equidistantly spaced, the outside notches 37 and 38 being slightly less than 90° apart. The notches are adapted to cooperate with a ball detent 41 urged against edge 39 by a spring 42 held within an inward extension 43 of housing 13 by a retaining member 44. When handle 24 is in its intermediate position, ball detent 41 will be received by notch 36. Notches 37 and 38 define the handle positions at which the transmission is fully engaged in either its forward or reverse position, and after a short additional movement of the handle during which the throttle setting remains unchanged, further handle movement will begin to increase the throttle setting. These positions are described in further detail below, detent 41 being provided in order to indicate to the operator, either audibly or at least by increased resistance to handle movement, that either position has been reached.

Element 32 is also an interrupted gear, as seen in FIGURE 6, of somewhat larger diameter than gear 29. With handle 24 in its idle position, a convex arcuate surface 45 on gear 32 is disposed above shaft 23. A first plurality of teeth 46 is formed on one side of gear 32 and a second plurality of teeth 47 is formed on the other side, a second convex arcuate surface 48 being formed at the bottom of gear 32. Tooth groups 46 and 47 occupy somewhat wider arcs than that occupied by teeth 34 on gear 29, and the first tooth in either group 46 and 47 is adapted to arrive at the top of gear 32 in FIGURE 6 shortly after one end or the other of convex surface 35 arrives at the top of gear 29 when the handle 24 is shifted. This delayed action or dwell movement permits a smooth start of throttle opening after the transmission has been shifted.

Control handle shaft 23 is slidable to the left from the position shown in FIGURE 2 when control handle 24 is in its upright or neutral position. For this purpose, a pair of grooves 49 and 51 are formed at the right hand end of shaft 23 as seen in FIGURE 2. With the shaft in its inner or right hand position as seen in this figure, a detent 52 slidably mounted in housing end member 21 is disposed within groove 49, the detent being urged into the groove by a coil spring 53 held in position by a plug 54. An axial groove 55 connects grooves 49 and 51, as seen in FIGURE 2, and is aligned with detent 52 only when handle 24 is in its intermediate position. When in this position, handle 24 may therefore be pulled to the left in FIGURE 2, sliding shaft 23 to the left until detent 52 is disposed within groove 51. The spacing between grooves 49 and 51 is such that upon this leftward movement of shaft 23, key 28 will be withdrawn from gear 29. Thereafter, rotation of handle 24 and shaft 23 will only cause rotation of disc 31 and gear 32, gear 29 being held stationary by means later described.

An annular transmission control shaft 56 is rotatably mounted in a bearing 57 carried by housing end member 21 in spaced parallel relation with bearing 19. A throttle control shaft 58 is rotatably mounted within shaft 56, one end of shaft 58 being supported by a bearing 59 formed within housing 12 in spaced parallel relation with bearing 18.

A transmission control driven element 61 is secured to the inner end of shaft 56 within housing 12. Element 61 comprises an interrupted gear of about the same diameter as gear 29 having a single complete tooth 62 between two tooth spaces which receive teeth 34 when gear 29 is in the position shown in FIGURE 4. A pair of concave arcuate surfaces 63 and 64 on opposite sides of the spaces which receive teeth 34 are provided on gear 61. When gear 29 is rotated in either direction, one of these concave surfaces will engage convex surface 35, locking gear 61 in a predetermined angular position about 45° from its neutral position as seen in FIGURE 4. A ball detent 65 is provided within end member 21, this detent being urged by a spring 66 against the adjacent surface of gear 61. A recess 67 in said surface is adapted to receive detent 66 when gear 61 is in its neutral position, thus tending to hold gears 29 and 61 in this position.

A throttle control driven element 68 is fixed to shaft 58 adjacent bearings 59, this element being in the form of an interrupted gear of smaller diameter than gear 32 as seen in FIGURE 6. Gear 68 has a concave surface 69 which interfits with convex surface 45 when gear 32 is in its idle position as seen in FIGURE 6. A plurality of teeth 71 are formed on the remainder of the periphery of gear 68, these teeth being engageable by teeth 46 or 47 when gear 32 is rotated from its FIGURE 6 position.

Three teeth 71 are formed on each side of gear 68, and each set of teeth 46 and 47 is shown as having four teeth. The relationship between gears 32 and 68 is therefore such that gear 68 may be rotated slightly less than 180° from the idle position of FIGURE 6 when gear 32 is rotated in either direction, until one end or the other of convex surface 48 comes into interfering relation with gear 68.

A transmission control arm of adjustable length indicated generally at 72 is secured to the outer end of shaft 56 by nuts 73, as seen in FIGURES 2 and 3. Arm 72 extends horizontally to the right of housing 12, as seen in FIGURE 3, when handle 24 is in neutral position. The arm comprises a first section 72*a* fixed to shaft 56 and a second section 72*b* adjustably secured to a slightly offset portion of section 72*a* by set screws 72*c* passing through elongated slots 72*d* in section 72*a* and threadably mounted in section 72*b*. Section 72*a* has an elongated depression 72*e* which receives a ridge 72*f* formed on section 72*b* to maintain a rigid relationship between the sections when drawn together by set screws 72*c*. Indicia 72*g* may be provided on section 72*b* for preselecting the length of arm 72.

A transmission control cable indicated generally at 74 is connected to the outer end of arm 72. More particularly, cable 74 has an outer conduit or sheath 75 and an inner conduit or core 76, a control rod 77 being secured to the outer end of core 76 and extending toward the outer end of arm 72. A pivotal connection 78 is provided between the upper end of control rod 77 and arm 72, the arm being shown as having a plurality of apertured portions 79 for preselecting the position of pivot 78. A guide sleeve 81 is secured to the upper end of outer conduit 75 and surrounds control rod 77. In one commercial embodiment of the invention, the linear travel of control rod 77 could be varied between 2½ inches and 4 inches by adjustment of arm 72, thus making unit 11 adaptable for various types of marine engine transmissions and adjustable to compensate for changes during continued use.

A cable supporting bracket 82 is secured to the outer surface of housing end member 21 by bolts 83, as seen in FIGURES 2 and 3, and extends downwardly therefrom, this bracket having an intermediate portion inclined downwardly and away from support 15. A transmission control cable support bracket 84 is secured to the lower end of bracket 82 by bolts 85. Bracket 84 is of elongated shape and extends to the right of bracket 82 as seen in FIGURE 3. A core bearing portion 86 is secured to the upper end of outer conduit 75, serving to connect sleeve 81 to the outer conduit, core 76 being slidably supported by bearing portion 86. A clamp 87 is secured to bracket 84 by fasteners 88, and serves to secure bearing portion 86 to bracket 84.

When in the position as shown in FIGURE 3, cable 74 is inclined slightly to the right of the vertical. Since the total movement of arm 72 will be about 45° in either direction from the FIGURE 3 position, there will be only slight flexing of cable 74 as control rod 77 slides in and out of sleeve 81.

A throttle control cable generally indicated at 89 is also mounted on bracket 82. The means for mounting cable 89 on bracket 82 includes a throttle control cable support bracket 91 rockably mounted on a pivot 92 to the rear of bracket 82 at the lower end thereof. Cable 89 has a sheath or outer conduit 93 to which is secured a bearing portion 94 for core 95. A clamp 96 is secured by fasteners 97 to the rear surface of bracket 91 so as to clamp support 94 to bracket 91. A guide sleeve 98 is secured to the upper end of bearing portion 94, and a control rod 99 is secured to the upper end of core 95 and extends from sleeve 98.

A throttle control arm 101 is secured by a fastener 102 to the outer end of shaft 58 and extends upwardly therefrom when handle 24 is in its intermediate position. The upper end of control rod 99 is secured by a pivotal connection 103 to the outer end of arm 101. The arrangement is therefore such that when arm 101 is rocked in either direction from its idle position, as seen in FIGURE 3, the initial angular movement of arm 101 will result in relatively little sliding movement of control rod 99 within sleeve 98. However, as the angular distance of arm 101 from the idle position increases, each equal increment of angular movement of arm 101 will result in a relatively greater increment of sliding movement of control rod 99 within sleeve 98.

In operation, assuming an initial position of the unit as shown in the figures, control cable 74 will be connected to the reversible transmission of a marine engine (not shown), the transmission being in its neutral position. Cable 89 will be connected to the throttle control on such engine (also not shown), the throttle being in its idle position. Unit 11 may be mounted on a support 15 which extends in a fore-and-aft direction, so that movement of control handle 24 in a forward direction, say clockwise in FIGURE 1, will cause shifting of the transmission to its forward position, while counterclockwise shifting of handle 24, that is, toward the stern of the craft, will cause shifting of the transmission to its reverse position.

Clockwise shifting of handle 24 in FIGURE 1 will cause rotation of shaft 23 in a counterclockwise direction as seen in FIGURES 4 to 6. Detent 41 will be forced out of recess 36 of disc 31, and gear 61 will be rotated by gear 29, causing detent 65 to leave recess 67. Shaft 56 will be rotated in a direction causing clockwise rotation of arm 72 in FIGURE 3, moving control rod 77 downwardly a distance determined by the adjusted length of arm 72.

Meanwhile, surface 45 of gear 32 will move along concave surface 69 of gear 68, locking arm 101 in its idle position. When surface 35 of gear 29 becomes interfitted with surface 64 of gear 61, control rod 77 will have been shifted sufficiently to cause the transmission to arrive in its forward position, and the transmission will thereafter be locked in this position by the interlocking surfaces 35 and 64. At this point, detent 41 will enter recess 38, indicating to the operator the arrival of the control handle at what may be termed its forward position and from which opening of the throttle may be accomplished after the short additional handle movement described above.

When this additional movement (about one inch or five degrees of travel of knob 26 in a suitable embodiment of the invention having a handle length of about eight inches) has been completed, teeth 47 of gear 32 will begin to mesh with teeth 71 of gear 68. Further rotation of handle 24 in a clockwise direction, as seen in FIGURE 1, will thus cause arm 101 to shift in a clockwise direction as seen in FIGURE 3.

As arm 101 begins to rock clockwise in FIGURE 3, control rod 99 will be very gradually forced downwardly into sleeve 98. The opening of the throttle may thus be controlled to a relatively fine degree at low throttle settings. As arm 101 increases its angular distance from idle position, that is, for higher throttle settings, the control will be relatively coarse, due to the fact that each successive equal angular increment of movement of arm 101 will result in a greater shifting movement of control rod 99.

When it is desired to reduce the throttle setting, handle 24 will be swung counterclockwise in FIGURE 1 toward the intermediate position shown in that figure. This will cause counterclockwise movement of arm 101 in FIGURE 3 toward its idle position. Here again, as the throttle moves toward lower settings, the relative fineness of control will be increased. When the throttle reaches its idle position and handle 24 has passed through the dwell movement described above, detent 41 will enter recess 38, indicating to the operator that further movement of handle 24 will shift the transmission from its forward toward its neutral position.

At this time, surface 45 of gear 32 will have again come into engagement with surface 69 of gear 68, holding the throttle in its idle position. Further movement of handle 24 in a counterclockwise direction, as seen in FIGURE 1, will cause teeth 34 on gear 29 to engage gear 61, moving arm 72 counterclockwise toward the position shown in FIGURE 3. When arm 72 reaches this position, the transmission will have been shifted to neutral, and detents 45 and 65 will enter recesses 36 and 67 respectively to indicate the arrival of handle 24 at its intermediate position.

Shifting of the transmission to its reverse position will be accomplished by rotating handle 24 counterclockwise from the intermediate position of FIGURE 1, the action being obvious from the above description, with arm 72 swinging counterclockwise from the position of FIGURE 3. After detent 41 has entered recess 37, denoting the arrival of handle 24 at its reverse position, further movement of handle 24 past the dwell arc will cause counterclockwise shifting of throttle control arm 101 from its FIGURE 3 position. Here again, relatively fine throttle control at low settings will be achieved by the geometrical relationship of arm 101 and cable 89.

Should it be desired to open the throttle when the transmission is in neutral, handle 24 is placed in its intermediate position and then pulled to the left in FIGURE 2. This will disengage shaft 23 from gear 29, and when groove 51 is aligned with detent 52, handle 24 may be rotated past its forward and reverse positions in the usual manner to change the throttle settings. Detent 65 will meanwhile retain transmission control shaft 56 in its neutral position. To return the handle to its first or normal intermediate position, it is again placed in an upright position and pushed to the right in FIGURE 2, reengaging key 28 with gear 29.

While it will be apparent that the preferred embodiment of the invention disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a remote control mechanism for marine engines, a control handle shaft, a control handle on said shaft, said handle and shaft being rockable in opposite directions from an intermediate position in either direction to and past a forward and a reverse position, a transmission control shaft, driving and driven elements connecting said control handle shaft and said transmission control shaft and responsive to movement of said control handle from its intermediate to either its forward or reverse

positions for shifting said transmission control shaft to a forward or a reverse position, a throttle control shaft, driving and driven elements connecting said control handle shaft and said throttle control shaft and responsive to movement of said control handle past said forward or reverse position for rotating said throttle control shaft from an idle position, a throttle control cable, a throttle control arm on said throttle control shaft and connected to said throttle control cable, and means supporting said throttle control cable in a position such that said cable and arm are substantially aligned when said throttle control shaft is in its idle position.

2. In a remote control mechanism for marine engines, a control handle shaft, a control handle on said shaft, the shaft and handle being rockable from an intermediate position in either direction to and past a forward or a reverse position, a transmission control shaft, driving and driven elements connecting said control handle shaft and transmission control shaft, coacting portions on said driving and driven elements responsive to movement of the control handle to either its forward or reverse position for rotating said transmission control shaft from a neutral position to a forward or reverse position and responsive to movement of said control handle past said forward or reverse position for holding said transmission control shaft in said forward or reverse position, a throttle control shaft, driving and driven elements connecting said control handle shaft and throttle control shaft, coacting portions on said last-mentioned driving and driven elements for holding said throttle control shaft in an idle position when said control handle is positioned between said forward and reverse positions and responsive to movement of said control handle past said forward or reverse position for rotating said throttle control shaft in either direction from said idle position, a throttle control cable, and means connecting said throttle control shaft to said throttle control cable, said last-mentioned means being responsive to initial rotation of said throttle control shaft in either direction from its idle position to shift said throttle control cable in one direction and in relatively small increments, and responsive to further rotation of said throttle control shaft to shift said throttle control cable in the same direction but in relatively greater increments.

3. The combination according to claim 2, further provided with detent means connected to said control handle shaft for releasably holding the control handle shaft in either its intermediate, forward or reverse position.

4. The combination according to claim 2, further provided with means connecting said control handle shaft with said transmission control driving element, and means responsive to axial shifting of said control handle shaft for disenabling said last-mentioned connecting means.

5. The combination according to claim 4, further provided with means for preventing said last-mentioned axial shifting movement of said control handle shaft when the control handle shaft is out of said intermediate position.

6. In a remote control mechanism for marine engines, a housing, a control shaft rotatably mounted in said housing, a control handle fixed to said shaft, coaxial transmission control and throttle control shafts rotatably mounted in said housing in spaced parallel relation with said control shaft, transmission control and throttle control driving elements on said control shaft, a transmission control driven element on said transmission control

shaft, a throttle control driven element on said throttle control shaft, a throttle control arm fixed to said throttle control shaft and having an idle position, and a throttle control cable support on said housing, a line connecting the center of said support and the axis of said throttle control shaft being aligned with the idle position of said arm.

7. The combination according to claim 6, said control cable support comprising a bracket pivoted to said housing, means for securing the outer conduit of a control cable to said bracket, and means for pivotally connecting the inner conduit of a control cable to said arm.

8. The combination according to claim 6, further provided with a transmission control arm of adjustable length fixed to said transmission control shaft and having a neutral position substantially at right angles to the idle position of said throttle control arm, and means on said housing for supporting a transmission control cable for connection to said transmission control arm.

9. In a remote control mechanism for marine engines, a housing, a control handle shaft rotatably mounted in said housing, a control handle on said shaft, the control handle and shaft being rockable in either direction from an intermediate position, a throttle control shaft rotatably mounted in said housing, driving and driven elements operatively connecting said shafts, a throttle control arm on said throttle control shaft and having an idle position, a bracket pivotally mounted on said housing, the axes of said bracket pivot and said throttle control shaft being aligned with the idle position of said throttle control arm, means on said bracket for securing the outer conduit of a throttle control cable thereto, and means for pivotally securing the inner conduit of a throttle control cable to the outer end of said throttle control arm.

10. The combination according to claim 9, said throttle control shaft being disposed between the outer end of said throttle control arm and said bracket supporting pivot when the arm is in said idle position.

11. In a remote control mechanism for marine engines, a housing, a control shaft rotatably mounted in said housing, a control handle fixed to said shaft, transmission control and throttle control shafts rotatably mounted in said housing in spaced relation with said control shaft, transmission control and throttle control driving elements on said transmission control shaft, a transmission control driven element on said transmission control shaft, a throttle control driven element on said throttle control shaft, a transmission control arm of adjustable length, said transmission control arm having a first section fixed to said transmission control shaft, a second section partially overlapping said first section, at least one set screw connecting said sections, an elongated recess on one of said sections extending in the direction of extent of said arm, an elongated ridge on the other section interfitting with said recess, and means on said other section for connecting a transmission control cable thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

2,907,421	Morse et al.	Oct. 6, 1959
2,924,987	Pierce	Feb. 16, 1960
2,960,199	Morse	Nov. 15, 1960
3,043,159	Morse	July 10, 1962