

April 26, 1960

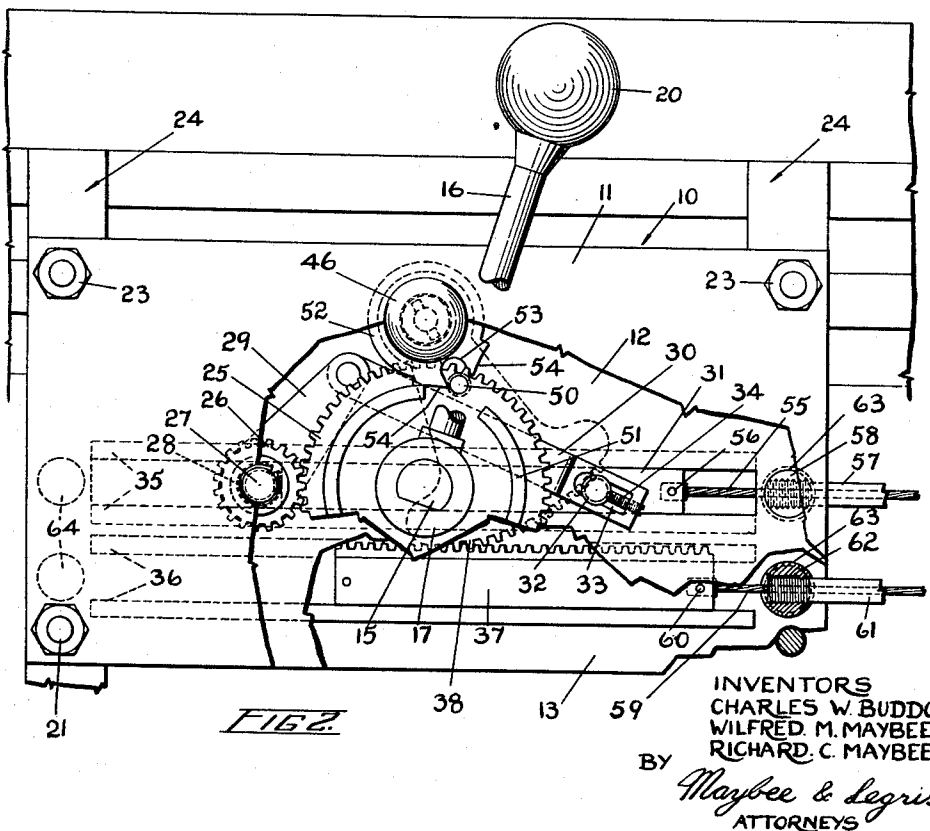
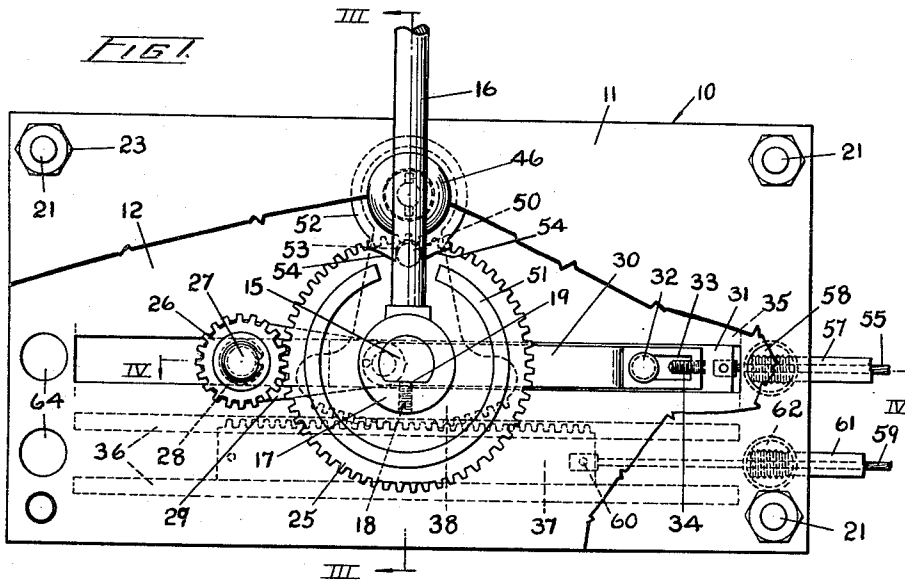
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2,933,943

SINGLE LEVER OPERATING CONTROLS

Filed Oct. 31, 1958

2 Sheets-Sheet 1



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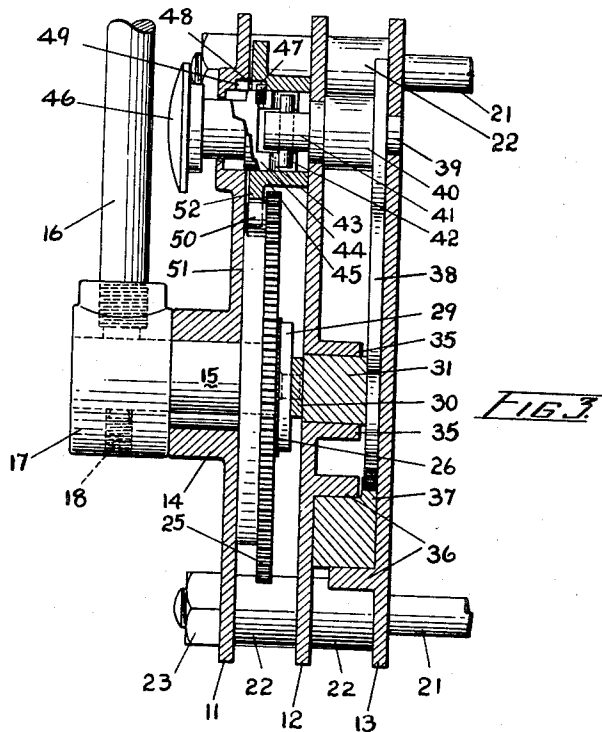


FIG. 3

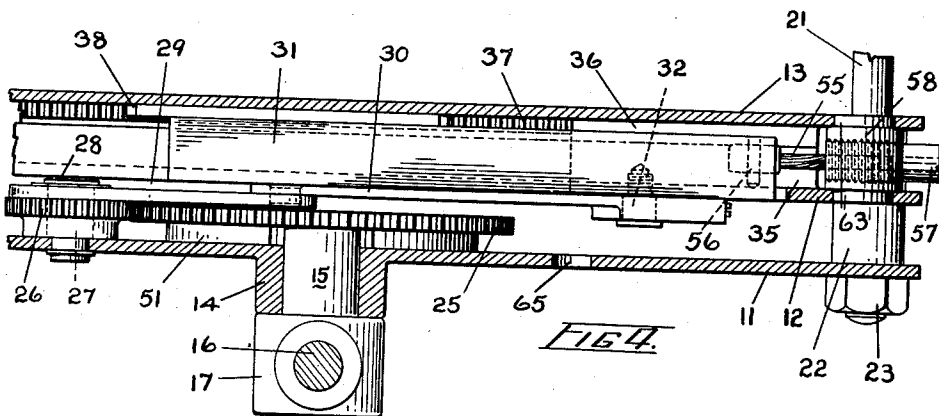


FIG. 4

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SINGLE LEVER OPERATING CONTROLS

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Application October 31, 1958, Serial No. 771,025

10 Claims. (Cl. 74-471)

This invention relates to single lever operating controls for two operating leads.

The invention is particularly adapted for use as a remote control of an outboard motor of a boat. On such motors it is necessary to shift the gear from forward to reverse and vice versa and also to control the throttle setting. Various types of remote control have been proposed whereby the motor may be controlled from the forward part of the boat. Normally such remote controls include two operating levers, one lever to control the gear shift and the other lever to control the throttle opening. The levers are connected to the motor by flexible Bowden cables.

Since outboard motors do not have clutches it is necessary that the throttle setting be substantially at its minimum value when the gears are shifted from forward to reverse or vice versa. With a two lever remote control it is possible to forget to reduce the throttle setting before shifting from one gear to the other and such an operation may damage the motor.

Attempts have been made to overcome this disadvantage of a two lever remote control by using a single lever control which both shifts the gears and controls the throttle. With such control the throttle setting is automatically reduced before gear shifting is effected. However, such single lever controls have not proved popular, except on larger outboard motors, due to their high first cost and considerable complexity. Moreover, previously proposed single lever controls have required special operating cables.

It is therefore an object of this invention to provide a single lever remote control for two operating leads which is simple to manufacture.

It is another object of this invention to provide a remote control for two operating leads which is simple to install and simple to operate.

It is a further object of this invention to provide a single lever remote control which may easily be mass produced and may be sold comparatively cheaply.

It is another object of the invention to provide a remote control for an outboard motor which may be mounted on either the port or starboard side of the boat without special adapters and which employs the operating cables normally used for conventional two lever controls.

The invention will now be described by way of example with reference to the accompanying drawings, in which like reference numerals indicate like parts throughout the several views and in which:

Figure 1 is a front elevation of a control according to the invention, partly broken away to show its internal structure, with the operating lever in its neutral position;

Figure 2 is a view similar to Figure 1, also partly broken away, showing the positions of the parts of the mechanism after the lever has been moved from its neutral position;

Figure 3 is a transverse section on the line III—III of Figure 1, and

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Figure 4 is a horizontal section on the line IV—IV of Figure 1.

Referring now to the drawings, the control includes a housing, indicated generally at 10, consisting of an outer plate 11, an intermediate plate 12 and an inner plate 13. The outer plate 11 is provided with a hollow boss 14 in which is journaled a main shaft 15. The shaft 15 has an operating lever 16 secured thereto by means of a collar 17. The collar is drilled and tapped to receive a grub screw 18, the end of which engages a flat 19 on the shaft to hold the operating lever in position. At its free end the operating lever is provided with a knob 20.

The plates 11, 12 and 13 are secured together by studs 21 having distance pieces 22 between adjacent plates. The outer ends of the studs 21 carry nuts 23 and the inner ends are secured to a convenient part of the boat indicated generally at 24 in Figure 2; in the example shown in the drawings the control is mounted on the starboard side of the boat.

Secured to the main shaft 15, within the housing, is a first pinion 25 which meshes with a second pinion 26 mounted for rotation on a shaft 27 and retained on the shaft by a circlip 28. Mounted to rotate with the second pinion is a crank 29 which, at its free end, is pivotally secured to one end of a link 30, the other end of the link being pivotally connected to a slidable bar 31 by a pin 32. The end of the link 30 which is connected to the bar 31 is slotted as best shown at 33 in Figure 1. Mounted in the end of the link and projecting into the slot 33 is an adjusting screw 34. The pin 32, the slot 33, and the adjusting screw 34, together form a lost motion device whereby the movement of the crank 29 from the position shown in Figure 1 will not begin to affect the bar 31 until the free play between the pin 32 and the end of the adjusting screw 34 has been taken up.

Referring now to Figure 3, the bar 31 is constrained to slide between guides 35 formed in the intermediate plate 12. A further pair of guides 36 is provided, one of the pair being formed on the inner plate 13 and the other guide being formed on the intermediate plate 12. Between the guides 36 is received a toothed rack 37 which is free to slide longitudinally and meshes with a toothed quadrant 38 mounted upon a shaft 39 for rotation within the housing. The shaft is supported between the plates 12 and 13 and is shouldered at 40 where it is received by the plate 12. A portion 41 of the shaft of reduced diameter projects towards the outer plate 11 and has a diametrically extending pin 42 passing therethrough.

The pin 42 engages in oppositely disposed slots 43 in a core 44 which is slidable within a sleeve 45; the core 44 passes through the outer plate 11 and has at its free end an operating knob 46. The core is slidable axially between first and second positions and is shown in Figure 3 in its first position. In this position the pin 42 is received within the slots 43 so that the quadrant and the core rotate together. The core is provided with a projecting pin 47 which, when the core is in the first position, is received within a slot 48 in the sleeve 45. The slot is only just wide enough to take the pin so that when the pin is in the slot the core and the sleeve rotate together. To place the core in its second position it is moved to the left in Figure 3 so that the pin 47 moves out of the slot 48 into a slot 49 in the outer plate 11 while at the same time the slots 43 in the core become disengaged from the pin 42 on the quadrant shaft 39.

Referring now in particular to Figures 1 and 2, the first pinion 25 has upstanding from one surface thereof a pin 50 and also a sector-shaped abutment 51. The pin 50 and the abutment 51 lie in a substantially annular zone with the ends of the sector-shaped abutment 51 spaced from the pin 50 as shown. Secured to the sleeve 45 is a

cam 52 having a notch 53 to receive the pin 50 and, on each side of the notch, a cam surface 54. In the neutral position of the lever, as shown in Figure 1, the pin 50 is received in the notch 53. As the lever is turned from the neutral position to the position shown, for example, in Figure 2, the pin 50 is moved out of the notch 53, thereby turning the cam, the cam surfaces 54 being so arranged that, as shown in Figure 2, one of them comes into contact with the sector-shaped abutment 51 before the pin 50 is completely clear of the notch 53.

The bar 31 and the rack 37 are provided with means for the attachment of the ends of the inner cables of flexible Bowden cables. The bar 31 has an inner cable 55 secured thereto at 56 and the outer sheath 57 of the inner cable 55 has one end secured in an internally threaded nipple 58. Similarly, the rack 37 has secured thereto an inner cable 59, the cable being secured at 60. The outer sheath 61 of the inner cable 59 has one end held by an internally threaded nipple 62. The nipples 58 and 62 are received in apertures in the intermediate and inner plates 12 and 13, the apertures being indicated at 63. Similar apertures are provided at 64 at the other end of the plates for a purpose which will hereinafter be described.

The operation of the control is as follows: the control is installed in a boat so that one end of the inner cable 55 is secured to the bar 31 and the other end of the inner cable is secured to the throttle control (not shown) on an outboard motor. The outer cable 57 has one end secured in the nipple 58 and the other end suitably anchored on the outboard motor. One end of the inner cable 59 is secured to the toothed rack 37 as shown and the other end is secured to the gear shift lever (not shown) on the outboard motor. Similarly one end of the outer cable 61 is secured in the nipple 62 and the other end is suitably secured on the outboard motor.

The position in which the control is shown in Figure 1 is its neutral position and during installation the throttle control on the motor itself is set so that the desired slow running speed is attained with the parts in the position shown in Figure 1.

If it is desired to proceed in a reverse direction the lever 20 is rotated in a clockwise direction, as seen in Figures 1 and 2. The rotation of the lever 16 rotates the first pinion 25 thereby moving the pin 50 in a clockwise direction out of the notch 53 in the cam 52. Consequently the cam 52 is turned and one of the cam surfaces 54 comes into contact with the sector-shaped abutment 51 as shown in Figure 2. With the core 44 in its first position as shown in Figure 3, the cam, with the sleeve 45, is operatively connected to the quadrant 38 through the slots 43 and the pin 42. It follows that upon rotation of the cam the quadrant will also rotate about its pivotal axis and consequently the rack 37 will move towards the right as shown in Figure 2. This movement of rack towards the right moves the inner cable 59 and engages the reverse gear on the motor.

Simultaneously with the rotation of the quadrant, the first pinion 25 rotates the second pinion 26 and therefore moves the crank 29. As shown in Figure 1, the crank is in the dead center position with regard to the bar 31 when the lever is in neutral position. The first effect on rotation of the crank 29 is that the free play between the pin 32 and the adjusting pin 34 in the slot 33 of the link 29 is taken up. The amount of free play is adjusted so that the movement of the cable 59 will have engaged the gear on the motor before substantial movement of the throttle takes place. Further rotation of the lever to the position shown in Figure 2 advances the bar 31 and thereby moves the inner cable 55 to open the throttle on the motor. It will be seen that once the lever has been turned to a sufficient extent that one of the cam surfaces 54 has engaged the sector-shaped abutment 51, further rotation of the lever will only advance the throttle and will not advance

the toothed rack so that once a gear has been engaged it cannot be disengaged while the throttle is open.

If the lever is now rotated in an anti-clockwise direction to the neutral position, the parts will again take up the positions shown in Figure 1. During the anti-clockwise rotation the pin 50 will enter the notch 53, will turn the cam 52 back to the position shown in Figure 1 and will thereby rotate the rack to disengage the gear. If now it is desired to go forwardly, the lever is moved in an anti-clockwise direction from the neutral position and a similar sequence of events takes place as that described for going into reverse. The pin 50 moves out of the notch 53 and brings one of the cam surfaces 54 into engagement with the sector-shaped abutment 51; movement of the cam turning the quadrant to move the rack to engage forward gear. Moreover, since the crank 29 is in the dead center position relatively to the bar 31 when the lever is in neutral position, rotation of the second pinion 26 in either direction from the neutral position will have the same effect, i.e., the free play between the pin 32 and the adjusting pin 34 will first be taken up and then the bar 31 will be moved. As before, the free play is such as to enable the rack to move the gear shift into gear before the throttle is substantially opened.

Sometimes it is desirable that the motor be run at a higher throttle setting than minimum while still out of gear so that it may be warmed up with the boat standing still. For this purpose means have been provided for disengaging the gear shift from the throttle. However, these means are so arranged that the gear shift can only be disconnected from, or re-engaged with, the throttle when the lever is in neutral position. This precludes accidental engagement or disengagement of the gear when the throttle is wide open which would result in damage to the motor or gear box.

The disengageable means provided comprises the axially slidable core 44 which co-acts with the quadrant and the sleeve 45. When the core is in its first position, as shown in Figure 3, there is a driving connection between the quadrant and the cam. However, if the core is moved to its second position, by being moved to the left in Figure 3, the pin 42 comes out of the slots 43 and the pin 47 moves out of the slot 48 into the slot 49 in the outer plate 11. This movement of the core 44 is only possible when the lever is in its neutral position because the slot 49 in the outer plate 11 is so orientated that the pin 47 can only pass into the slot when the lever is in the neutral position. It will be seen that when the core has been withdrawn to its second position there is no driving connection between the cam 52 and the quadrant 38. It follows that, with the core in its second position, the lever may be turned in either direction to operate the throttle mechanism but that, during the movement, motion of the cam will not be communicated to the quadrant 38 and therefore the engine will not be placed in gear. In order to be able to engage gear it is necessary for the operating lever to be brought back into its neutral position after the engine is warmed up thus allowing the core 44 to be moved back to its first position. This is only possible when the lever is in the neutral position because the slot 48 in the sleeve 45 is only in alignment with the slot 49 in the outer plate 11 when the lever is in the neutral position.

The control may be mounted on either side of the boat as desired. When mounted on the starboard side of the boat it will be connected up as shown in the drawings but if placed on the port side the Bowden cables will have their outer cables anchored in the apertures 64 at the left of Figure 2. Moreover, a further hole 65 is provided in the outer plate 11 to receive the shaft 27 of the second pinion 26 when the control is to be mounted on the port side. The hole 65 is located at the other side of the boss 14 from the hole in which the shaft 27 is shown as being mounted in the drawings. If it is desired to use the con-

trol on the port side of the boat then the pinion 27 with

its associated shaft is mounted in the hole 65 and the control then operates in a similar manner to that shown and described hereinbefore.

It will be seen that the invention provides a simple and versatile single lever control especially suitable for the remote control of outboard motors. Moreover, the control can be easily fabricated and is very simple to install. Furthermore, the control is economical in that it uses the normal operating cables provided for a conventional two lever control.

It will be understood that the form of the invention herewith shown and described is a preferred example and various modifications can be carried out without departing from the spirit of the invention or the scope of the appended claims.

What we claim as our invention is:

1. A single lever operating control for two operating leads comprising a housing, an operating lever journaled for rotation in the housing to either side of a neutral position, a member mounted within the housing to rotate with the lever, a crank mounted to rotate in response to rotation of the member, a connector bar slidably mounted in the housing, means interconnecting the bar and the crank, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant mounted for rotation in the housing, a toothed rack slidably mounted in the housing and meshing with the quadrant, first and second abutments on said member, a Geneva cam rotatably mounted in the housing, driving means between the cam and the quadrant, a notch in the cam to receive the first abutment when the lever is in neutral position, cam surfaces on the cam on both sides of the notch to co-act with the second abutment to keep the cam in a turned position when the lever has moved from the neutral position to turn the cam by moving the first abutment out of the notch, and means to connect one operating lead to the bar and the other operating lead to the rack.

2. A single lever operating control for two operating leads comprising a housing, an operating lever journaled for rotation in the housing to either side of a neutral position, a member mounted within the housing to rotate with the lever, a crank mounted to rotate in response to rotation of the member, a connector bar slidably mounted in the housing, means interconnecting the bar and the crank, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant mounted for rotation in the housing, a toothed rack slidably mounted in the housing and meshing with the quadrant, first and second abutments on said member, a Geneva cam rotatably mounted in the housing, disconnectable driving means between the cam and the quadrant, a notch in the cam to receive the first abutment when the lever is in neutral position, cam surfaces on the cam on both sides of the notch to co-act with the second abutment to keep the cam in a turned position when the lever has moved from the neutral position to turn the cam by moving the first abutment out of the notch, and means to connect one operating lead to the bar and the other operating lead to the rack.

3. A single lever operating control for two operating leads comprising a housing, an operating lever journaled for rotation in the housing to either side of a neutral position, a member mounted within the housing to rotate with the lever, a crank mounted to rotate in response to rotation of the member, a connector bar slidably mounted in the housing, means interconnecting the bar and the crank, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant mounted for rotation in the housing, a toothed rack slidably mounted in the housing and meshing with the quadrant, first and second abutments on said member, a Geneva cam rotatably mounted in the housing, driving means between the cam and the quadrant, a notch in the cam to receive the first abutment when the lever is in neu-

tral position, cam surfaces on the cam on both sides of the notch to co-act with the second abutment to keep the cam in a turned position when the lever has moved from the neutral position to turn the cam by moving the first abutment out of the notch, means to connect one operating lead to the bar and the other operating lead to the rack, and a lost motion device in the means interconnecting the bar and the crank so that as the lever is turned from the neutral position one of the cam surfaces is in contact with the second abutment before substantial movement of the bar takes place.

4. A single lever operating control for two operating leads comprising a housing, an operating lever journaled for rotation in the housing to either side of a neutral position, a member mounted within the housing to rotate with the lever, a crank mounted to rotate in response to rotation of the member, a connector bar slidably mounted in the housing, means interconnecting the bar and the crank, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant mounted for rotation in the housing, a toothed rack slidably mounted in the housing and meshing with the quadrant, first and second abutments on said member, a Geneva cam rotatably mounted in the housing, disengageable driving means between the cam and the quadrant, a notch in the cam to receive the first abutment when the lever is in neutral position, cam surfaces on the cam on both sides of the notch to co-act with the second abutment to keep the cam in a turned position when the lever has moved from the neutral position to turn the cam by moving the first abutment out of the notch, means to connect one operating lead to the bar and the other operating lead to the rack, and a lost motion device in the means interconnecting the bar and the crank so that as the lever is turned from the neutral position one of the cam surfaces is in contact with the second abutment before substantial movement of the bar takes place.

5. A single lever operating control for two operating leads comprising a housing, an operating lever journaled for rotation in the housing to either side of a neutral position, a member mounted within the housing to rotate with the lever, a crank mounted to rotate in response to rotation of the member, a connector bar slidably mounted in the housing, means interconnecting the bar and the crank, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant mounted for rotation in the housing, a toothed rack slidably mounted in the housing and meshing with the quadrant, first and second abutments on said member, a sleeve rotatably mounted in the housing, a Geneva cam secured to the sleeve, a core axially movable within the sleeve, disengageable interengaging means on the core and the sleeve, further disengageable interengaging means on the core and the quadrant, both said interengaging means being disengageable only when the lever is in neutral position, a notch in the cam to receive the first abutment when the lever is in neutral position, cam surfaces on the cam on both sides of the notch to co-act with the second abutment to keep the cam in a turned position when the lever has moved from the neutral position to turn the cam by moving the first abutment out of the notch, and means to connect one operating lead to the bar and the other operating lead to the rack.

6. A single lever operating control for two operating leads comprising a housing, an operating lever journaled for rotation in the housing to either side of a neutral position, a member mounted within the housing to rotate with the lever, a crank mounted to rotate in response to rotation of the member, a connector bar slidably mounted in the housing, means interconnecting the bar and the crank,

the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant mounted for rotation in the housing, a toothed rack slidably mounted in the housing and meshing with the quadrant, first and second abutments on said member, a sleeve rotatably mounted in the housing, a Geneva cam secured to the sleeve, a core axially movable within the sleeve between first and second positions, a pin extending radially from the core, in the first position the pin being received in a slot in the cam and securing the cam and the core together for rotation, and in the second position, the pin being received in a slot in the housing to hold the core against rotation, disengageable interengaging means between the core and the quadrant, said means being engaged when the core is in the first position and being disengaged when the core is in the second position, the pin and the slot in the housing only being in alignment when the lever is in the neutral position so that the core may only assume its second position when the lever is in the neutral position, a notch in the cam to receive the first abutment when the lever is in neutral position, cam surfaces on the cam on both sides of the notch to co-act with the second abutment to keep the cam in a turned position when the lever has moved from the neutral position to turn the cam by moving the first abutment out of the notch, and means to connect one operating lead to the bar and the other operating lead to the rack.

7. A single lever operating control for two operating leads comprising a housing, a main shaft journaled for rotation in the housing, an operating lever secured to the shaft to rotate therewith to either side of a neutral position, the lever projecting from the housing, a pinion secured to the shaft within the housing, a second pinion journaled for rotation in the housing and meshing with the first pinion, a crank movable with the second pinion, a link pivotably secured at one end to the crank, a bar slidably mounted in the housing and pivotally secured to the other end of the link, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant journaled for rotation in the housing, a toothed rack slidably mounted in the housing and meshing with the quadrant, the rack being in a central position when the lever is in its neutral position, a pin on the first pinion, a sector shaped abutment on the first pinion, the pin and the abutment lying in an annular zone concentric with the pinion and the ends of the abutment being spaced from the pin, a Geneva cam rotatably mounted in the housing, disengageable driving means interconnecting the cam and the quadrant for simultaneous rotation, said means being capable of being disengaged only when the lever is in neutral position, a notch in the cam to receive the pin when the lever is in neutral position, and cam surfaces on the cam on either side of the notch arranged to co-act with the sector shaped abutment to keep the cam in a turned position when the lever has been moved from the neutral position to turn the cam by moving the pin out of the notch.

8. A single lever operating control for two operating leads comprising a housing, a main shaft journaled for rotation in the housing, an operating lever secured to the shaft to rotate therewith to either side of a neutral position, the lever projecting from the housing, a pinion secured to the shaft within the housing, a second pinion journaled for rotation in the housing and meshing with the first pinion, a crank movable with the second pinion, a link pivotably secured at one end to the crank, a bar slidably mounted in the housing and pivotally secured to the other end of the link, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant journaled for rotation in the housing, a toothed rack slidably mounted in

the housing and meshing with the quadrant, the rack being in a central position when the lever is in its neutral position, a pin on the first pinion, a sector shaped abutment on the first pinion, the pin and the abutment lying in an annular zone concentric with the pinion and the ends of the abutment being spaced from the pin, a sleeve rotatably mounted in the housing, a Geneva cam secured to the sleeve, a core axially movable within the sleeve, disengageable interengaging means on the core and the sleeve, further disengageable interengaging means on the core and the quadrant, both said interengaging means being disengageable only when the lever is in neutral position, a notch in the cam arranged to mate with the pin, cam surfaces on the cam on either side of the notch arranged to co-act with the sector shaped abutment to keep the cam in a turned position when the lever has been moved from the neutral position to turn the cam by moving the pin out of the notch, and a lost motion device on the link connecting the bar and the crank so that as the lever is turned from its neutral position one of the cam surfaces is in contact with the sector shaped abutment before substantial movement of the bar takes place.

9. A single lever operating control for two operating leads comprising a housing, an operating lever journaled for rotation in the housing to either side of a neutral position, a member mounted within the housing to rotate with the lever, a crank mounted to rotate in response to rotation of the member, two pairs of parallel guides in the housing, a connector bar slidably mounted between the guides of one of said pairs of guides, means interconnecting the bar and the crank, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant mounted for rotation in the housing, a toothed rack slidably mounted between the guides of the other of said pair of guides and meshing with the quadrant, first and second abutments on said member, a Geneva cam rotatably mounted in the housing, driving means between the cam and the quadrant, a notch in the cam to receive the first abutment when the lever is in neutral position, cam surfaces on the cam on both sides of the notch to co-act with the second abutment to keep the cam in a turned position when the lever has moved from the neutral position to turn the cam by moving the first abutment out of the notch, and means to connect one operating lead to the bar and the other operating lead to the rack.

10. A single lever operating control for two operating leads comprising a housing, having a pair of opposite sides, an operating lever journaled for rotation in the housing to either side of a neutral position, a member mounted within the housing to rotate with the lever, two spaced apart mounts in the housing, one of said mounts being adjacent to one of said sides and the other of said mounts being adjacent to the other of said sides, a crank on one of said mounts and arranged to rotate in response to rotation of the member, two pairs of parallel guides in the housing extending between said opposite sides, a connector bar slidably mounted between the guides of one of said pairs of guides, means interconnecting the bar and the crank, the crank being in dead center position relative to the bar when the lever is in its neutral position, a toothed quadrant mounted for rotation in the housing, a toothed rack slidably mounted between the guides of the other of said pair of guides and meshing with the quadrant, first and second abutments on said member, a Geneva cam rotatably mounted in the housing, driving means between the cam and the quadrant, a notch in the cam to receive the first abutment when the lever is in neutral position, cam surfaces on the cam on both sides of the notch to co-act with the second abutment to keep the cam in a turned position when the lever has moved from the neutral position to turn the

cam by moving the first abutment out of the notch, and means to connect one operating lead to the bar and the other operating lead to the rack.

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