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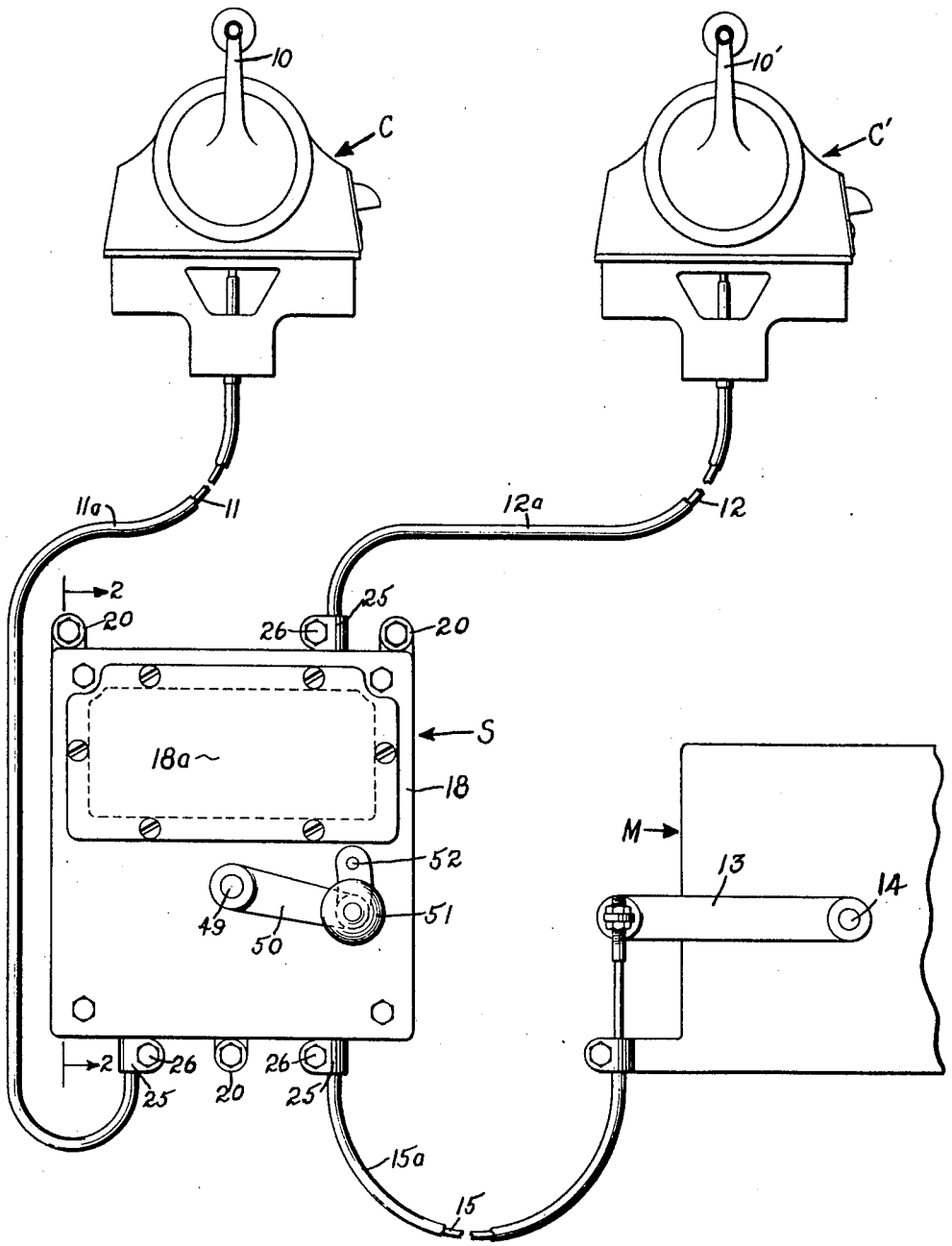
Sept. 12, 1944. E. J. PANISH 2,358,094

SWITCH-OVER DEVICE

Original Filed June 26, 1941 4 Sheets-Sheet 1

Fig. 1

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MACHINE ELEMENTS AND MECHANISMS
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SWITCH-OVER DEVICE

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Fig. 3

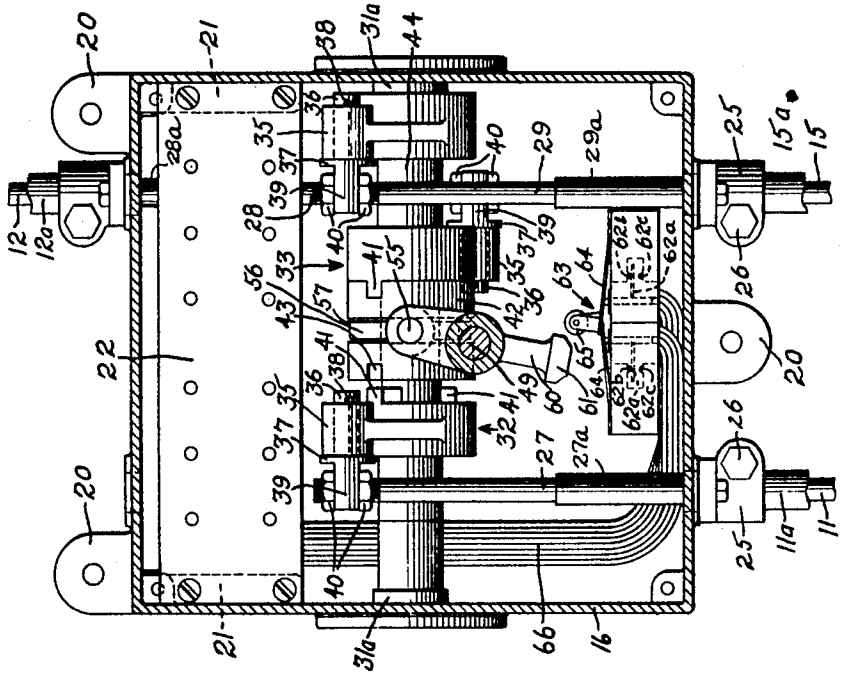
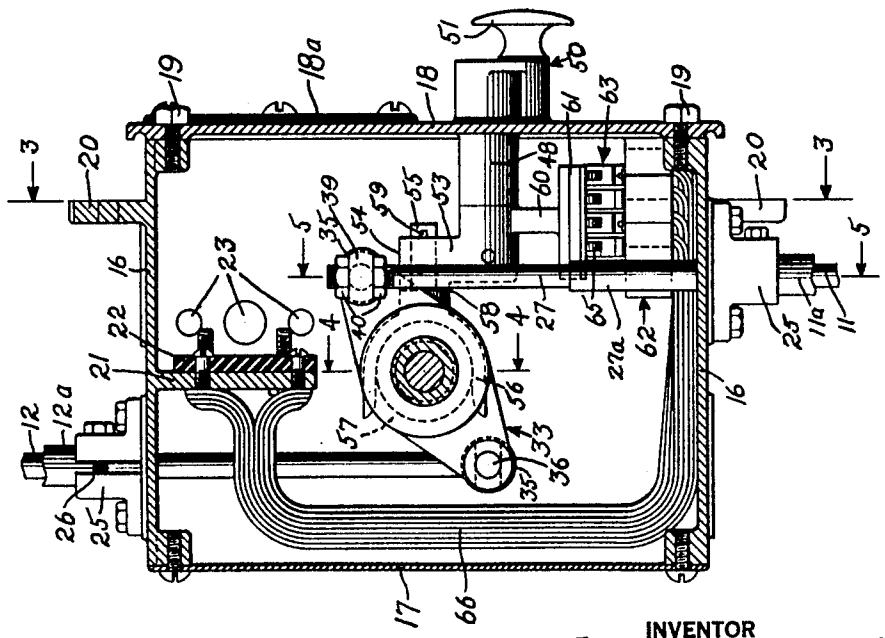


Fig. 2



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SWITCH-OVER DEVICE

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Fig. 6

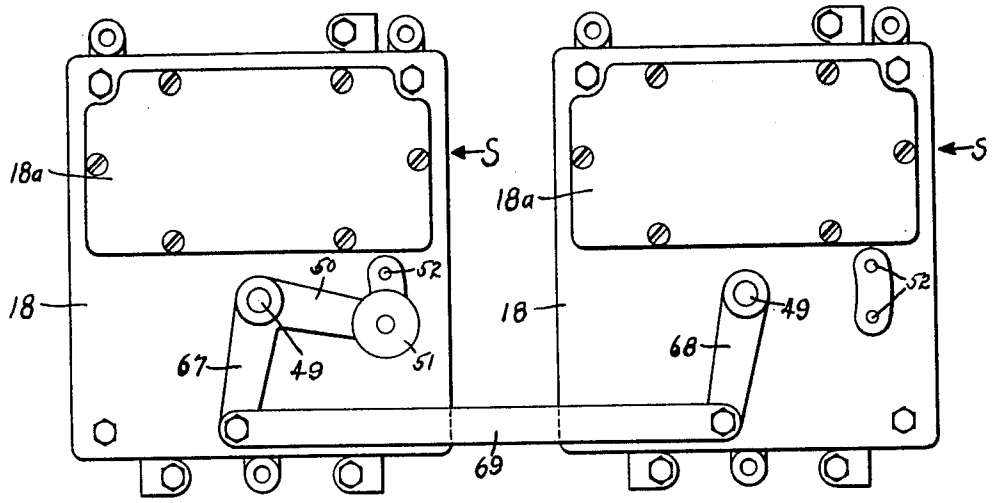


Fig. 4

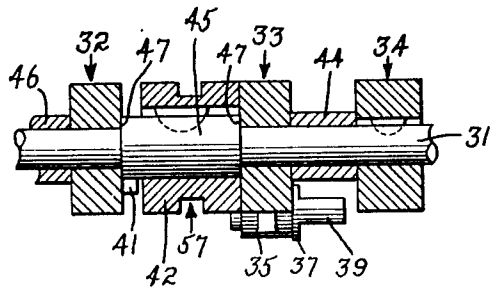


Fig. 5

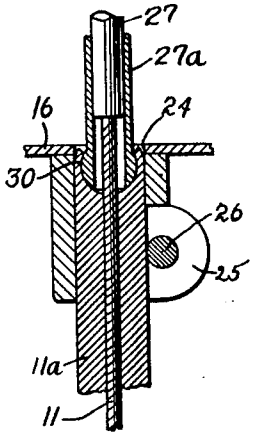


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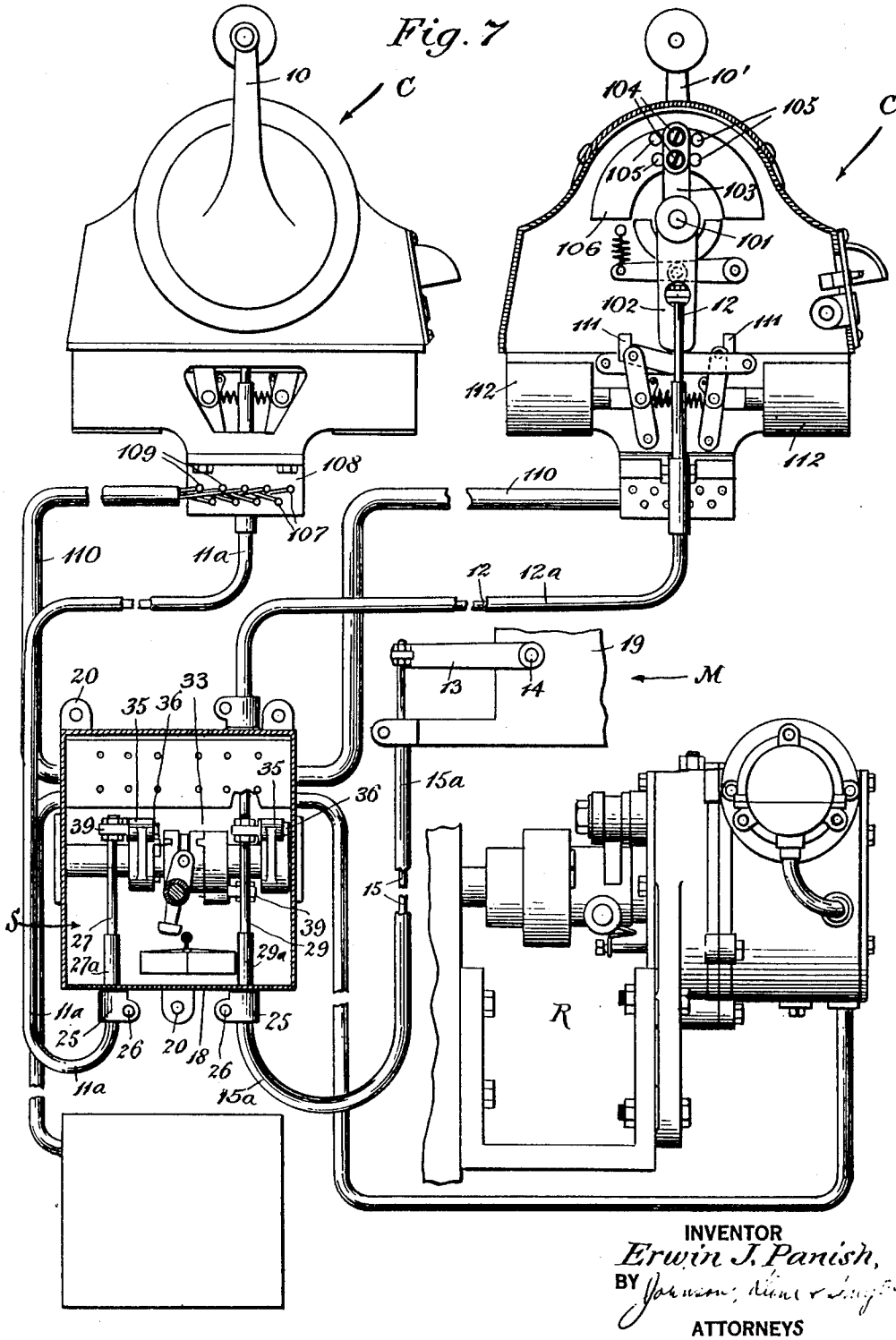
Fig. 7

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# UNITED STATES PATENT OFFICE

2,358,094

## SWITCH-OVER DEVICE

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Original application June 26, 1941, Serial No. 399,951. Divided and this application June 26, 1941, Serial No. 399,950

3 Claims. (Cl. 74—479)

The present invention relates to a selector or switch-over device for use in a control system having a plurality of control stations for operating the same control device, especially a device requiring a plurality of operations for its control.

The present application is a divisible part of the invention disclosed in my copending application Serial No. 399,951, filed June 26, 1941, relating to a marine control system.

It is an object of the present invention to provide a switch-over device adapted to connect a controlled device, requiring a plurality of control operations, to a selected control station, whereby only a single operation is required for transferring the control of all of said operations from one control station to another; and more specifically to provide a switch-over device of the aforesaid type for transferring an electrical, as well as a mechanical, control from one control station to another.

Another object is to provide a switch-over device adapted to transfer the control of a plurality of operations from one control station to another, to the exclusion of all but one station.

A further object is to provide a switch-over device so constructed that similar motion of a control member at any selected control station is adapted to effect similar control operations in the controlled device.

A preferred embodiment of the invention is described hereinafter and illustrated in the accompanying drawings in which:

Figure 1 is a schematic view of a portion of a control system, including a pair of control stations, the switch-over device of the present invention shown in front elevation, and a device to be controlled from the control stations.

Fig. 2 is a vertical cross-section of the switch-over device of Fig. 1 along the line 2—2'.

Fig. 3 is a vertical cross-section along the line 3—3 in Fig. 2.

Fig. 4 is an axial cross-section of the bearing shaft and the operating levers carried thereby, substantially along the line 4—4 in Fig. 2.

Fig. 5 is a detail in axial cross-section of the ball and socket mounting for Bowden wires, substantially along the line 5—5 in Fig. 2.

Fig. 6 is a view in front elevation of an arrangement for simultaneous control of two switch-over devices.

Figure 7 is a schematic view of the control system of the present invention for a single prime mover comprising a pair of control stations, the interior of one and the exterior of the other being illustrated; a switch-over device with its cover plate removed to show the interior mechanism thereof; and a reverse gear-actuating mechanism in side elevation together with fragmentary portions of engine mechanism controlled thereby, including a reverse gear operating shaft and a throttle control lever.

The control stations C and C' each comprises a manually operated lever 10 or 10' adapted respectively to effect a mechanical control through Bowden wires 11 and 12, which connect the control stations to the switch-over device S. The latter is connected by means of a Bowden wire 15 to a lever 13, pivoted at 14 and included in the mechanism M to be controlled. The switch-over device S is constructed to connect Bowden wires 11 or 12 with the Bowden wire 15 in such a manner that corresponding operation of levers 10 or 10' is adapted to produce similar operation of the lever 13.

As shown in detail in Fig. 7, the manually operated lever 10' is secured to a shaft 101 having an arm 102 connected to the Bowden wire 12 leading to the switch-over device S. The shaft 101 also carries an arm 103 having contacts 104 adapted to engage contacts 105 on a segment 106. These contacts are connected to terminals 107 on a terminal board 108 to which are connected wires 109 leading to the switch-over device S through conduits 110. The contacts 104 and 105 control the operation of a reverse gear and clutch operating mechanism R for the engine and are so arranged that when the control lever is in intermediate position the clutch is thrown out. When it is advanced in one direction, the clutch is thrown in for forward operation, and when it is advanced in the other direction, the clutch is thrown in for reverse operation. Each control station also includes an interlocking device 111 controlled by solenoids 112 which, in a manner more specifically described in my copending application Serial No. 399,951 filed concurrently herewith, through electrical connections also contained within the conduits 110 and controlled by the reverse gear operating mechanism R, prevents advancement of the control lever in either direction beyond a predetermined point until the clutch is engaged. The electrical connections passing through the conduits 110 from each control station are connected selectively by the switch-over mechanism in a manner described below to wires leading to the reverse gear mechanism R and carried in a conduit 113.

The switch-over device comprises a rectangular casing 16 comprising top, bottom, and side walls, and provided with a rear cover plate 17,

and a front cover plate 18 having a removable section 18a, said cover plates being secured to the casing 16 by means of bolts 19. The casing 16 is provided with perforated lugs 20 for securing the device to a suitable support.

Interiorly of the casing, a pair of ribs 21 extend downward from the top wall along the side walls providing supports to which a terminal plate 22 of insulating material is secured. In one side wall, a number of apertures 23 are provided to accommodate insulated conductors to be connected to the terminals on said terminal plate, for joining the switch-over device with electrical control means in the control station, and with electrical devices of the mechanism to be controlled.

Apertures 24 are provided in the top and bottom walls of the casing 16 to accommodate the ends of the Bowden wires 11, 12 and 15. A split clamp 25 is secured to the casing at each of these apertures and is adapted to engage the sheaths 11a, 12a or 15a of the Bowden wires. A bolt 26 is provided for tightening the split clamps against the said sheaths. The Bowden wires 11, 12 and 15 terminate in rigid rods 27, 28 and 29, which are telescopically mounted in sleeves 27a, 28a and 29a, protruding through the apertures 24 into the casing. Ball and socket joints 30, as illustrated in Fig. 5, are provided at each of the clamps to permit limited angular displacement of the rigid rods secured to the Bowden wires and the sleeves which carry the rods.

A main shaft 31 is provided having its opposite ends journaled in bearings 31a in the side walls of the casing midway between the top and bottom walls. The clamps 25 on the bottom wall of the casing for receiving Bowden wires 11 and 15, are disposed on the same side of the shaft 31. The clamp 25 for Bowden wire 12 is disposed on the opposite side of the shaft, each of the clamps 25, and the ball and socket joints 30 enclosed therein being equidistant from the axis of the shaft.

Two spaced operating levers 32 and 33 are mounted for free pivotal motion about the axis of the main shaft while a third similar lever 34 is keyed thereto. These operating levers are provided with bearings 35 eccentrically disposed and equidistant from the axis of the shaft 31, for receiving pins 36 which are journaled therein and retained in the bearings by a shoulder 37 and a retaining pin 38. Beyond the said shoulder, each of said pins is extended in the form of a flattened perforated lug 39 to which the ends of the operating rods 27, 28 and 29 of the Bowden wires are attached. A pair of nuts 40 threaded to the ends of the rods secure them to the flattened lug 39 on the pin 36.

The levers 32 and 33, secured to Bowden wires 11 and 12, are provided with projections 41 on their adjacent or inner faces. When the pins 36 of these levers are disposed in diametrically opposite positions on either side of the main shaft, the said projections are adapted to engage a clutch member 42 carried on the main shaft between the two levers, having recesses 43 for engaging the said projections.

The lever 34 connected to Bowden wire 15, is disposed adjacent one end wall of the casing and a collar 44 spaces it from adjoining lever 33. The clutch member 42 is keyed to a thickened portion 45 of shaft 31 and is adapted to rotate therewith, but at the same time it is slidable axially of the shaft for alternate engagement with levers 32 and 33 connected to Bowden wires 11 and 12.

The lever 32 connected to Bowden wire 11 is spaced from the other end wall of the casing by means of a collar 46, and from lever 33 by shoulders 47 on the ends of the thickened portion 45 of shaft 31. Accordingly, levers 32 and 33 are freely pivoted about the axis of the shaft.

Levers 32 and 33 are so spaced that the clutch member 44 is adapted by to and fro motion to engage one or the other of the two lever faces, but has no neutral or disengaged position. The teeth 41 and recesses 43 are so disposed that the clutch member 42 can only be shifted from one engaged position to the other when the two levers 32 and 33 extend from the shaft 31 in diametrically opposite positions.

The cover plate 18 is provided with a bearing 48 which extends into the casing and accommodates an operator shaft 49. On its outer end, the latter carries an operating lever 50 extending radially therefrom and having a grip member or knob 51 at its end. The said lever 50 is provided with detent means adapted to snap into a pair of recesses 52 provided on the cover plate of the device for positioning it in one or the other of a pair of angularly spaced positions. On its inner end, the said operating shaft is provided with a crank 53. A bearing 54 near the end of the said crank receives a cylindrical extension 55 of a forked member 56 which engages the clutch member 42 by means of an annular groove 57 in the latter. The forked member 56 is provided with a shoulder 58 engaging one end of the bearing 54 on the crank and a cotter pin 59 is inserted into the other end of the extension 55 to retain the fork against removal from its bearing.

The hub of crank 53 is also provided with a radial extension 60 shown as protruding downward in the opposite direction from the crank arm and terminating in a cam or foot 61. Below the said cam, a plurality of switches 62 are secured to the casing, each comprising an operator 63 supported by a spring 64 and having a roller 65 at its upper end for engaging the cam 61. In one position of the crank 53, the cam is adapted to depress all of the said microswitch operators, while upon movement to the opposite position, the said switches are all released, springs 64 moving them to their opposite position. As shown in dotted lines in Fig. 3, each switch is adapted, by means of a bridging contactor 62a, to close one of a pair of circuits by bridging an upper pair of contacts 62b when the switches are released by cam 61, and alternately to close another circuit through a lower pair of contacts 62c when engaged by the said cam.

Conductors 66 are provided to connect switches 62 to the terminal plate 22.

Operation of the device is as follows:

When the operating handle 50 is moved to its lower position as shown in the drawings, cam 61 has released microswitches 62, while the fork 56 carried by the crank 53 has moved the clutch member 42 to the right, engaging the lever 33 connected to the Bowden wire 12 of control station C', and thereby coupling the lever 33 through sleeve 44 with the lever 34 connected to the Bowden wire 15 of the controlled lever 13. Engagement of the detent on the end of the handle 50 with the lower recess 52 of the cover plate 18 retains the operating handle and crank 53 in this position until it is desired to transfer the control

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to the other control station. As long as microswitches 62 are released, the circuits through contacts 62b will be closed by bridging members 62a while the circuits through contacts 62c will be open.

Since the main shaft 31 is equidistant from the top and bottom walls of the casing 16 and consequently from the ball and socket joints 30 of the Bowden wires 12 and 15, and since the ends of the latter are joined to their respective levers 33 and 34 at diametrically opposite points, equidistant from the axis of the shaft, any linear movement of the Bowden wire 12 caused by moving control lever 10' of station C' will cause the other Bowden wire 15 to move a corresponding distance in its sheath.

When it is desired to transfer the control to station C, the levers 10 and 10' are first moved to corresponding positions so that levers 32 and 33 extend in diametrically opposite directions from shaft 31. The crank 53 is then moved to the left by raising handle 50, the engaged detent yielding to application of manual operating force and reengaging with the upper recess 52. The cam 61 is thereby moved to the right in Fig. 3, depressing the microswitch 62. The fork 56 is moved to the left by the crank 53 releasing the lever 33 connected to Bowden wire 12' and engaging the lever 32 connected to the other Bowden wire 11. Lever 32 is thereby coupled to the lever 34, connected to the Bowden wire 25, and since the two Bowden wires 11 and 15 are parallel, and the points at which they are joined to the respective levers are equidistant from the axis of the shaft 31, and equidistant from the respective ball and socket mountings 30, any lengthwise motion imparted to the Bowden wire 11 by motion of control station lever 10 is transmitted to the other Bowden wire 15.

Depression of microswitches 62 causes bridging members 62a to intercept the circuits through contacts 62b and close the circuits through contacts 62c.

The electrical circuits controlled by the microswitches are not shown. Suffice it to say that the microswitches are adapted in alternate positions respectively to connect the electric control circuits associated with the mechanism M to control switches included in control stations C and C' and operated by motion of levers 10 and 10'. The application of the switch-over device of the present invention for selecting one of a number of control stations and rendering the selected station operative to control the throttle of a marine engine by mechanical means, and the electrical circuits of the corresponding clutch or reverse gear operating mechanism are more fully described in my copending application Serial No. 399,951, filed June 26, 1941.

If it is desired to transfer the control of a plurality of similar systems from one control station to another, a switch-over device of the described type is provided for each system. It is possible, in this case to mount the switch-over devices adjacent each other, for instance, as shown in Fig. 6. In this case, the operator shafts 49 may be coupled for similar operation by means of a parallel linkage comprising, for instance, bell crank 67 on one operator shaft, radial arm 68 on the other and a rigid link 69 joining the two.

Features of the apparatus shown and described in this application are disclosed and claimed in my Patent #2,323,619, granted July 6, 1943, and in a division thereof, application Serial No 421,824, filed December 5, 1941.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. In a control system comprising a plurality of control stations, means in each of said stations for effecting a mechanical control and means for effecting an electrical control; an electric circuit and a mechanical operator to be controlled by either of said control stations; a selector device comprising means for coupling the mechanical control means of one of said control stations to said mechanical operator; selector switch means for selectively connecting the electrical control means of one of said control stations to said circuit; and common adjusting means for operating said coupling means and said switch means to render both the mechanical and electrical control means of a selected control station effective to control said circuit and said mechanical operator, to the exclusion of the other control stations.

2. In a selector device, a pair of mechanical operators coaxially mounted in spaced relation for independent pivotal motion; an intermediate pivotally mounted coaxial clutch member adapted to engage said operators in coupled relation; a pair of switch means for selectively closing a pair of circuits corresponding to said operators; and a pivotally mounted actuator for engaging said clutch member with a selected operator and for operating a corresponding switch means.

3. In a control system comprising a plurality of control stations, means in each of said stations for effecting a mechanical control and means for effecting an electrical control; an electric circuit and a mechanical operator to be controlled by either of said control stations; a selector device comprising means for coupling the mechanical control means of either control station to said mechanical operator; selector switch means for selectively connecting the electrical control means of either control station to said circuit; common adjusting means for operating said coupling means and said switch means to render both the mechanical and electrical control means of a selected control station effective to control said circuit and said mechanical operator, to the exclusion of the other control stations; and means for preventing effective operation of said common adjusting means when selector devices operated from several stations are in dissimilar positions.

ERWIN J. PANISH.