

May 29, 1962

W. S. KLEPPER

3,036,476

OUTBOARD ENGINE CONTROL

Filed Dec. 2, 1960

2 Sheets-Sheet 2

FIG. 3.

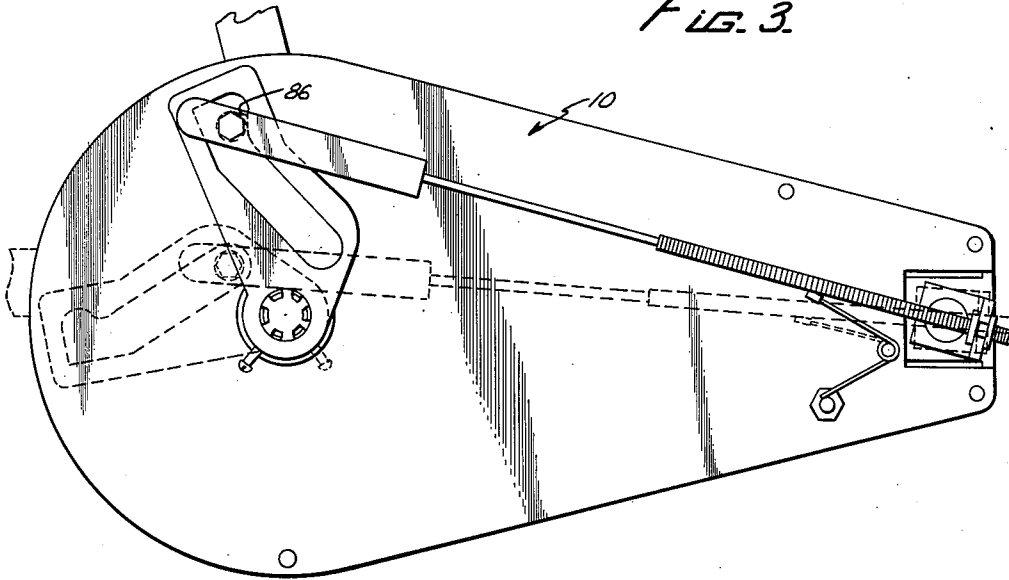


FIG. 4.

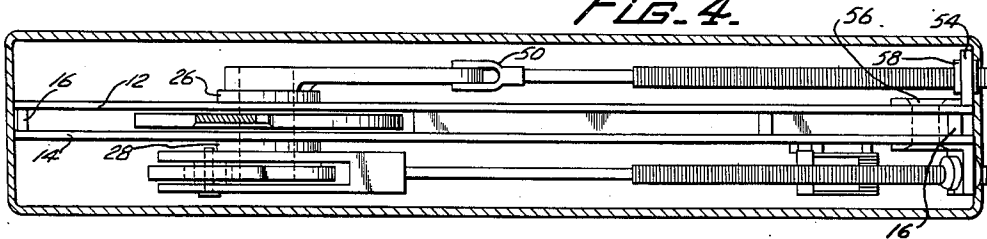
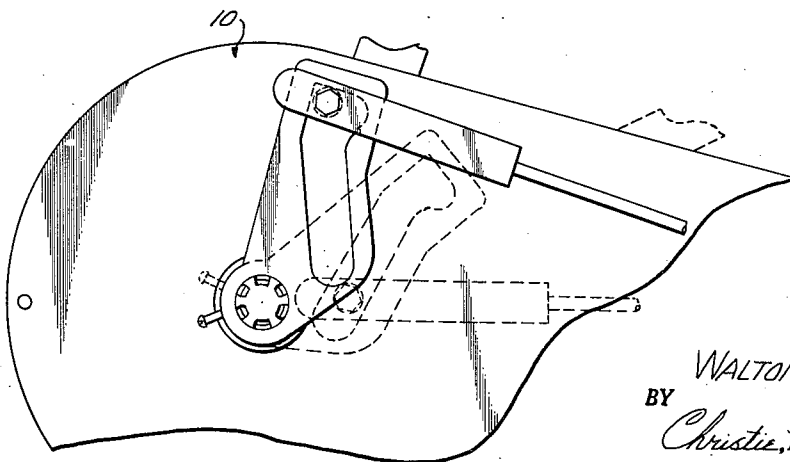


FIG. 5.



INVENTOR.

WALTON S. KLEPPER
BY
Christie, Parker & Hale
ATTORNEYS

1

3,036,476

OUTBOARD ENGINE CONTROL

Walton S. Klepper, 402 Montana St., Monrovia, Calif.

Filed Dec. 2, 1960, Ser. No. 73,301

12 Claims. (Cl. 74-472)

This invention relates to a manual control for the throttle and gear shift of an outboard engine, and more particularly, is concerned with a single lever control which combines both of these functions.

In the early development of outboard engines, the engines were relatively small and clamped on the transom of a small boat. The operator sat directly in front of the engine and steered the boat by means of a handle attached to the engine. The boat was reversed by turning the engine through 180°, and the handle was equipped as a throttle which twisted for varying the speed of the engine. With the advent of outboard engines of greatly increased power for use on larger boats, control of the engine has been moved forward. Steering is accomplished by a wheel which is connected to the engine through cables. A flexible cable connects a manual throttle lever back to the throttle control lever on the engine. Reverse motion of the boat is achieved through a reversing gear transmission which is part of the engine, the reversing gear lever on the engine being controlled through a flexible cable from the operator's position.

While such dual lever control, one lever for throttle control and one lever for reverse gear control, is in common usage today, it is cumbersome to operate, particularly when trying to maneuver a boat in and out of a small mooring space. This has given rise to the development of single lever controls which combine the function of throttle and shift lever operation. While such single lever controls have heretofore been proposed, they have incorporated apparatus which is complicated and expensive to construct and, therefore, too expensive for the average boat owner to purchase and install. The present invention provides a single lever control for the combined functions of throttle control and gear shift control which is less complicated in its design and less costly to build, and, at the same time, is foolproof in operation.

In brief, the present invention provides a single manually operated control arm, which when pushed forward engages the forward drive gear and then advances the throttle, and when the lever is moved backward, it engages the reverse gear drive and then advances the throttle. When the lever is placed in neutral position, the gear drive is placed in neutral and the throttle is set at idling. A unique cam linkage between the control lever and the flexible cable leading to the gear shift lever on the outboard engine provides positive action through the control cable to operate the gear shift lever through a small motion of the control arm in either direction around the neutral position. At the same time, the cam linkage permits the lever to be moved in either direction beyond the small range of motion necessary to engage the forward or reverse drive for operating the throttle.

For a more complete understanding of the invention, reference should be made to the accompanying drawings, wherein:

FIGURE 1 is a side elevational view of the control mechanism of the present invention and showing in particular the gear shift control in the neutral position;

FIGURE 2 is a side elevational view from the opposite side from that of FIGURE 1 and showing the throttle control;

FIGURE 3 is a side elevational view similar to FIGURE 1 but showing the gear shift control in the forward drive position;

FIGURE 4 is a top view of the control mechanism; and

2

FIGURE 5 is a partial side elevational view showing the gear shift control in the reverse drive position.

With particular reference to the form of the invention as shown in the drawings, the numeral 10 indicates generally the main frame of the single lever control assembly. As shown in FIGURE 4, the main frame 10 comprises two parallel plates 12 and 14 which are riveted or otherwise secured together with a plurality of spacers 16 maintaining a space between the plates.

The single lever control includes a lever arm 18 having a suitable handle 20 secured at its outer end. The inner end of the control lever arm 18 is secured to a detent disc 22 which in turn is secured to a shaft 24 journaled in bearing bushings 26 and 28. The bearing bushings are mounted respectively in the frame plates 12 and 14. The control lever arm 18 and the detent disc 22 are secured to the shaft 24 between the parallel frame plates 12 and 14, with the shaft 24 extending beyond the bearing bushings 26 and 28 on either side of the frame 10.

The detent disc 22 is provided with a large notch 30 and a plurality of equally spaced smaller notches on either side of the large notch 30. Detent action is provided by a lug 32 supported by a coil spring 34 which is anchored at its ends to pins 36 and 38 extending between the parallel frame plates 12 and 14. The coil spring 34 is maintained under tension so as to urge the lug 32 into the notches on the detent plate 22. The large notch 30 corresponds to the neutral position of the control lever arm 18.

The throttle control, which is shown in FIGURE 2, includes a throttle control arm 40 which is secured to one end of the shaft 24 and locked to the shaft by means of a locking screw 42. A flexible cable 44, including an outer sheath 46 and an inner cable wire 48, extends back to the throttle control of the outboard engine (not shown) in conventional fashion. The cable wire 48 is connected to the throttle arm 40 by a clevis 50 which is rotatably secured to the outer end of the throttle arm 40 by a pin 52. The sheath 46 is anchored to the frame 10 by means of an anchor lug 54 which rotates about a pin 56 secured to the frame plate 12. See FIGURE 4. The sheath 46 of the flexible cable 44 is securely connected to the anchor lug 54 by a clamping bushing 58.

With the control lever arm 18 in the neutral position, the throttle arm 40 is in the position shown in FIGURE 2. Thus as the arm is rotated in either direction from the neutral position, the wire 48 is withdrawn from the flexible cable and in turn imparting movement to the throttle on the engine. It will be seen that about the neutral position, the principal component of movement imparted by the throttle arm 40 is at right angles to the direction of movement of the cable wire 48 of the flexible cable. Thus very little throttle action takes place by movement of the control lever arm 18 about the neutral position.

It also should be noted that if the particular installation requires that the wire 48 of the flexible cable 44 be pushed instead of pulled to open the throttle on the engine, the throttle arm 40 can be rotated to 180° and locked in the dotted position shown in FIGURE 2.

The gear shift control linkage is shown in FIGURE 1 in the neutral position. Again connection to the gear shift lever of the engine (not shown) is through a flexible cable, indicated generally at 60, including an outer sheath 62 and an inner wire 64. The standard gear shift lever on an outboard engine has three positions, a forward drive position, a reverse drive position, and a neutral position. The gear shift lever is normally arranged so that a forward movement of the lever puts it into the forward drive position. With the flexible cable attached, this means that the wire 64 must be pulled in relation to the sheath 62. The wire 64 is pushed to move the lever into

the reverse position. The wire 64 has sufficient stiffness that it does not buckle under the normal pressures required to push the gear shift lever into the reverse position.

The sheath 62 is anchored to the frame 10 through an anchor lug 66 which is pivotally secured on the other end of the pin 56, as shown in FIGURE 4. A suitable bushing 68 locks the sheath 62 to the anchor lug 66. The pivotally supported anchor lug 66 permits the end of the sheath 62 and the cable wire 64 to be displaced in an arc parallel to the plane of the plate 14.

The wire 64 of the flexible cable 60 is coupled to the control lever 18 through a special linkage arrangement which includes a clevis member secured to the end of the wire 64, the clevis member rotatably supporting a cam roller 72 by means of a pin 74. The roller 72 engages a cam slot formed in a cam member 76, the cam member 76 being secured to the end of the shaft 24 by a locking screw 78. Suitable spring means, such as the helical torsion spring 80 of FIGURE 1, normally urges the roller 72 into the upper end of the cam slot in the cam member 76. The helical coil of the torsion spring 80 is wrapped around a pin 82 secured to the frame plate 14. One end of the torsion spring 80 is anchored to a pin 84 secured to the frame plate 14, while the other end of the torsion spring 80 presses against the lower edge of the sheath 62 to urge it in an upward direction. It will be appreciated that alternative spring arrangements may be employed for normally urging the roller into the upper end of the cam slot, such as a zig-zag compression spring located in the slot itself.

The slot in the cam member 76 is arranged to impart movement to the clevis 70 and associated cable wire 64 as the control lever arm 18 is moved in either direction about its neutral position. At the same time, the cam slot permits the cam member to move beyond the limits of movement of the clevis 70 and cable wire 64 when the gear shift becomes engaged in either the forward drive or reverse drive position. This additional movement of the control lever arm 18 opens the throttle after the gear shift is engaged.

FIGURE 3 shows the cam member 76 in the position in which the forward drive of the gear shift is engaged. As the lever arm 18 is moved forward, the roller 72 engages a surface portion 86 of the cam slot. In the neutral position, as shown in FIGURE 1, the plane of the surface 86 extends at an obtuse angle with relation to the cable wire 64. Thus as the lever arm 18 is moved forward, the roller 72 tends to wedge against the top of the cam slot. With the roller 72 wedged against the top of the cam slot, forward movement of the arm 18 applies a pulling force on the cable wire 64 causing the gear shift lever to engage in the forward drive position. When this condition is reached, the cable wire 64 reaches the limit of its movement. At this time, the lever arm 18 has assumed the position shown in FIGURE 3. The plane of the cam surface 86 now extends at an acute angle with relation to the longitudinal axis of the cable wire 64, imparting a downward wedging action to the roller 76 against the action of the spring 80. As the lever arm 18 is pushed further forward, the roller 72 moves down the back surface of the cam slot until, with the lever arm 18 in the full forward position, as shown by the dotted lines in FIGURE 3, the roller 72 reaches the lower end of the cam slot. It will be noted that the back surface of the lower portion of the cam slot, as indicated at 88, lies in a plane which extends at an angle to the plane of the upper portion 86. The projection of the plane forming the surface 88 extends to the right of the axis of the shaft 24. This arrangement, as best shown in FIGURE 3, permits greater forward movement of the control lever arm 18 without interference between the clevis 70 and the shaft 24 by reducing the downward displacement imparted to the roller 72 as the cam member 76 is rotated.

As the control lever arm 18 is moved back either from

the forward throttle position or from the neutral position, the roller 72 engages the front surface of the cam slot, the upper portion of which is indicated at 90. With the control lever in the neutral position, as shown in FIGURE 1, the plane of the surface 90 extends at an acute angle with relation to the longitudinal axis of the cable wire 64, causing the roller 72 again to be wedged up against the top of the cam slot. In this way, a positive pushing force is imparted to the cable wire 64 by the backward movement of the control lever arm 18.

When the reverse drive is engaged and the cable wire 64 reaches the limit of its movement in the backward direction, the cam member 76 is moved to the position shown in FIGURE 5. In this position, the front surface 90 of the upper portion of the cam slot now lies in a plane extending at an obtuse angle with relation to the longitudinal axis of the cable wire 64. Thus a downward wedging action is imparted to the roller 72 forcing it to move downward in the cam slot against the action of the spring 80. This permits the lever arm 18 to continue to be moved in a backward direction, after the reverse drive is engaged, to open the engine throttle. The full throttle position in the reverse direction is shown by the dotted lines in FIGURE 5.

As shown in FIGURE 1, a manual control button, indicated generally at 91, may be provided for disengaging the gear shift control so that the throttle can be operated independently. The manual control button 91 includes a guide block 92 mounted on the frame plate 14 in which is slidably supported a push rod 94. The outer end of the rod 94 is provided with a push button 96 by which the rod 94 can be pressed into engagement with the sheath 62 of the cable 60. A spring 98 normally holds the push button out of engagement with the cable 60. When the push button is depressed, it moves the cam roller 72 into the lower region of the cam slot, thus permitting the throttle to be operated without actuating the gear shift control.

From the above description it will be recognized that a single lever control having the combined function of shifting gears into either the reverse drive or the forward drive condition, and applying the throttle in both the forward drive and reverse drive conditions has been provided. A single forward motion of the control lever arm engages the forward drive and opens the throttle while the movement in the reverse direction engages the reverse drive and at the same time opens the throttle. The throttle is substantially unaffected by the limited movement of the control lever arm 18 required to engage either the forward drive or the reverse drive, so that the engine remains substantially at idling speed while the gear shift is being engaged for drive in either direction. Further movement of the control lever arm in either direction controls the throttle to provide the speed desired. The advantages and convenience of single lever control are achieved by the present invention with a relative simple but yet accurate positive control which is rugged in its construction and foolproof in its operation.

What is claimed is:

1. A combined throttle and gear shift control for outboard engines and the like comprising a frame, a gear shift control cable including a flexible sheath, a throttle control cable including a flexible sheath, an anchor bracket pivotally securing the flexible sheath of the gear shift control cable to the frame, means for anchoring the sheath of the throttle control cable to the frame, a control lever pivotally anchoring to the frame, a cam member connected to the control lever and pivotal therewith, the cam member having a slot, a cam roller positioned in the slot and movable therealong, a clevis secured to the end of the gear shift control cable, the roller being rotatably supported in the cam slot by the clevis, the slot having an outer portion remote from the pivotal axis of the cam member defined by first and second edges which converge in the direction toward the pivotal axis

5

of the cam member and having an inner portion defined by first and second edges contiguous respectively to the first and second edges defining the outer portion, the edges of the inner portion being substantially parallel and positioned within the angle formed between the pivotal point of the anchor bracket, the axis of rotation of the roller, and the pivotal point of the cam member, spring means for normally urging the cam roller toward the end of the slot remote from the pivotal axis of the cam member, and a throttle arm connected to the control lever and pivotal therewith, the throttle control cable being connected to the throttle arm with the longitudinal axis of the control cable extending so as to intersect the pivotal axis of the throttle arm when the control lever is in the neutral position.

2. A combined throttle and gear shift control for outboard engines and the like comprising a frame, a gear shift control cable including a flexible sheath, a throttle control cable including a flexible sheath, an anchor bracket pivotally securing the flexible sheath of the gear shift control cable to the frame, means for anchoring the sheath of the throttle control cable to the frame, a control lever pivotally anchored to the frame, a cam member connected to the control lever and pivotal therewith, the cam member having a slot, cam follower means positioned in the slot and secured to the end of the gear shift control cable, the slot having an outer portion remote from the pivotal axis of the cam member defined by first and second edges which converge in the direction toward the pivotal axis of the cam member and having an inner portion defined by first and second edges defining the outer portion, the edges of the inner portion being substantially parallel and positioned within the angle formed between the pivotal point of the anchor bracket, the position of the cam follower means, and the pivotal point of the cam member, spring means for normally urging the cam roller toward the end of the slot remote from the pivotal axis of the cam member, and a throttle arm connected to the control lever and pivotal therewith, the throttle control cable being connected to the throttle arm with the longitudinal axis of the control cable extending so as to intersect the pivotal axis of the throttle arm when the control lever is in the neutral position.

3. A combined throttle and gear shift control for outboard engines and the like comprising a frame, a gear shift control cable including a flexible sheath, a throttle control cable including a flexible sheath, an anchor bracket pivotally securing the flexible sheath of the gear shift control cable to the frame, means for anchoring the sheath of the throttle control cable to the frame, a control lever pivotally anchored to the frame, a cam member connected to the control lever and pivotal therewith, the cam member having a slot, a cam roller positioned in the slot and movable therealong, a clevis secured to the end of the gear shift control cable, the roller being rotatably supported in the cam slot by the clevis, the slot having an outer portion remote from the pivotal axis of the cam member defined by first and second edges which converge in the direction toward the pivotal axis of the cam member and having an inner portion defined by first and second edges contiguous respectively to the first and second edges defining the outer portion, the edges of the inner portion being substantially parallel and positioned within the angle formed between the pivotal point of the anchor bracket, the axis of rotation of the roller, and the pivotal point of the cam member, spring means for normally urging the cam roller toward the end of the slot remote from the pivotal axis of the cam member, and a throttle arm connected to the control lever and pivotal therewith, the throttle control cable being connected to the throttle arm.

4. A combined throttle and gear shift control for outboard engines and the like comprising a frame, a gear

6

shift control cable including a flexible sheath, a throttle control cable including a flexible sheath, an anchor bracket pivotally securing the flexible sheath of the gear shift control cable to the frame, means for anchoring the sheath of the throttle control cable to the frame, a control lever pivotally anchored to the frame, a cam member connected to the control lever and pivotal therewith, the cam member having a slot, cam follower means positioned in the slot and secured to the end of the gear shift control cable, the slot having an outer portion remote from the pivotal axis of the cam member defined by first and second edges which converge in the direction toward the pivotal axis of the cam member and having an inner portion defined by first and second edges contiguous respectively to the first and second edges defining the outer portion, the edges of the inner portion being substantially parallel and positioned within the angle formed between the pivotal point of the anchor bracket, the position of the cam follower means, and the pivotal point of the cam member, spring means for normally urging the cam roller toward the end of the slot remote from the pivotal axis of the cam member, and a throttle arm connected to the control lever and pivotal therewith, the throttle control cable being connected to the throttle arm.

5. A combined throttle and gear shift control for outboard engines and the like comprising a frame, a gear shift control cable including a flexible sheath, a throttle control cable including a flexible sheath, means for securing the flexible sheath of the gear shift control cable to the frame, means for anchoring the sheath of the throttle control cable to the frame, a control lever pivotally anchored to the frame, a cam member connected to the control lever and pivotal therewith, the cam member having a slot, cam follower means positioned in the slot and secured to the end of the gear shift control cable, and a throttle arm connected to the control lever and pivotal therewith, the throttle control cable being connected to the throttle arm.

6. A single lever control unit comprising a frame, a control lever rotatably supported by the frame, detent means for holding the lever in any one of a plurality of angular positions including a neutral position, first and second flexible cables having sheaths anchored to the frame, a lever arm rotatable about one end by the control lever, the first cable being connected to the lever arm, whereby movement of the control lever imparts longitudinal movement to the first flexible cable, a cam member rotated by the control lever, the cam arm having an elongated slot defining cam surfaces, cam follower means extending through the slot and engaging the cam surfaces formed by the slot, the end of the second flexible cable being connected to the cam follower means, and spring means normally urging the cam follower means along the slot in a direction substantially away from the rotational axis of the cam member, the elongated cam slot having first and second portions, the first portion having the opposite edges converging in the direction toward the rotational axis of the cam member and the second portion having the opposite edges substantially parallel and extending at an angle to the converging edges of the first portion of the slot, the second portion being skewed so that the cam follower means in moving along the slot moves oblique to a radius passing through the rotatable axis of the cam member and the cam follower means.

7. A single lever control unit comprising a frame, a control lever rotatably supported by the frame, first and second flexible cables having sheaths anchored to the frame, a lever arm rotatable about one end by the control lever, the first cable being connected to the lever arm, whereby movement of the control lever imparts longitudinal movement to the first flexible cable, a cam member rotated by the control lever, the cam arm having an elongated slot defining cam surfaces, cam follower

7

means extending through the slot and engaging the cam surfaces formed by the slot, the end of the second flexible cable being connected to the cam follower means, and spring means normally urging the cam follower means along the slot in a direction substantially away from the rotational axis of the cam member, the elongated cam slot having first and second portions, the first portion having the opposite edges converging in the direction toward the rotational axis of the cam member and the second portion having the opposite edges substantially parallel and extending at an angle to the converging edges of the first portion of the slot, the second portion being skewed so that the cam follower means in moving along the slot moves oblique to a radius passing through the rotatable axis of the cam member and the cam follower means.

8. A single lever control unit comprising a frame, a control lever rotatably supported by the frame, first and second flexible cables having sheaths anchored to the frame, a lever arm rotatable about one end by the control lever, the first cable being connected to the lever arm, whereby movement of the control lever imparts longitudinal movement to the first flexible cable, a cam member rotated by the control lever, the cam arm having an elongated slot defining cam surfaces, cam follower means extending through the slot and engaging the cam surfaces formed by the slot, the end of the second flexible cable being connected to the cam follower means, and spring means normally urging the cam follower means along the slot in a direction substantially away from the rotational axis of the cam member, the elongated cam slot extending at an oblique angle to the radius extending between the cam follower means and the rotational axis of the cam member when the control lever is in a neutral position, whereby the path of movement of the cam follower along the slot does not pass through the rotational axis.

9. Apparatus comprising a frame member, a rotatable shaft journaled in the frame, a control lever secured to the shaft for imparting angular rotation to the shaft, detent means for holding the lever and shaft in any one of a plurality of angular positions including a neutral position, a first flexible cable having a sheath anchored to the frame, an arm secured to the shaft and connected to the end of the first flexible cable for imparting longitudinal movement to the first cable with movement of the control lever, a second flexible cable having a sheath pivotally anchored to the frame at a point spaced substantially from the end of the cable, the end of the cable being movable longitudinally within the sheath a fixed distance and also being displaceable along an arc about the pivotal anchor point, a cam member secured to the shaft and rotatable therewith, the cam member having an elongated slot with one end closer to the axis of rotation of the shaft than the other end, cam follower means being movable along the slot and secured to the end of the second cable, and spring means for urging the cam follower means toward one end of the slot in a direction away from the axis of rotation of the shaft, the cam follower means engaging said one end of the slot when the control lever is in the neutral position and the second cable is half way between the limits of its fixed distance of movement, the edges of the slot adjacent said one end engaging the cam follower means when the control lever is moved from the neutral position to impart longitudinal movement to the second cable and wedging the cam follower means down the slot along the arcuate path of the cable end about the pivotal anchor against the urging of the spring means when the second cable reaches the limits of its longitudinal movement in either direction from the neutral position.

10. Apparatus comprising a frame member, a rotatable shaft journaled in the frame, a control lever secured to

8

the shaft for imparting angular rotation to the shaft, detent means for holding the lever and shaft in any one of a plurality of angular positions including a neutral position, a flexible cable having a sheath pivotally anchored to the frame at a point spaced substantially from the end of the cable, the end of the cable being movable longitudinally within the sheath a fixed distance about a neutral position and also being displaceable along an arc about the pivotal anchor point, a cam member secured to the shaft and rotatable therewith, the cam member having an elongated slot with one end closer to the axis of rotation of the shaft than the other end, cam follower means movable along the slot and secured to the end of the cable, and spring means for urging the cam follower means toward one end of the slot in a direction away from the axis of rotation of the shaft, the cam follower means engaging said one end of the slot when the control lever is in the neutral position and the cable is half way between the limits of its fixed distance of movement, the edges of the slot adjacent said one end engaging the cam follower means when the control lever is moved from the neutral position to impart longitudinal movement to the cable and wedging the cam follower means down the slot along the arcuate path of the cable end about the pivotal anchor against the urging of the spring means when the cable reaches the limits of its longitudinal movement in either direction from the neutral position.

11. Apparatus comprising a frame member, a rotatable shaft journaled in the frame, a control lever secured to the shaft for imparting angular rotation to the shaft, a flexible cable having a sheath pivotally anchored to the frame at a point spaced substantially from the end of the cable, the end of the cable being movable longitudinally within the sheath a fixed distance about a neutral position and also being displaceable along an arc about the pivotal anchor point, a cam member secured to the shaft and rotatable therewith, the cam member having an elongated slot, cam follower means movable along the slot and secured to the end of the cable, and spring means for urging the cam follower means toward one end of the slot in a direction away from the axis of rotation of the shaft, the cam follower means engaging said one end of the slot when the cable is half way between the limits of its fixed distance of movement, the edges of the slot adjacent said one end engaging the cam follower means when the control lever is moved from the neutral position to impart longitudinal movement to the cable and wedging the cam follower means down the slot along the arcuate path of the cable end about the pivotal anchor against the urging of the spring means when the cable reaches the limits of its longitudinal movement in either direction from the neutral position.

12. Apparatus comprising a frame member, a rotatable shaft journaled in the frame, a control lever secured to the shaft for imparting angular rotation to the shaft, a flexible cable having a sheath anchored to the frame at a point spaced substantially from the end of the cable, the end of the cable being movable longitudinally within the sheath a fixed distance about a neutral position and also being displaceable along an arc about the anchor point, a cam member secured to the shaft and rotatable therewith, the cam member having an elongated slot, cam follower means movable along the slot and secured to the end of the cable, and spring means for urging the cam follower means toward one end of the slot in a direction away from the axis of rotation of the shaft.

References Cited in the file of this patent

UNITED STATES PATENTS

2,867,131	Schroeder	Jan. 6, 1959
2,966,969	Morse	Jan. 3, 1961