

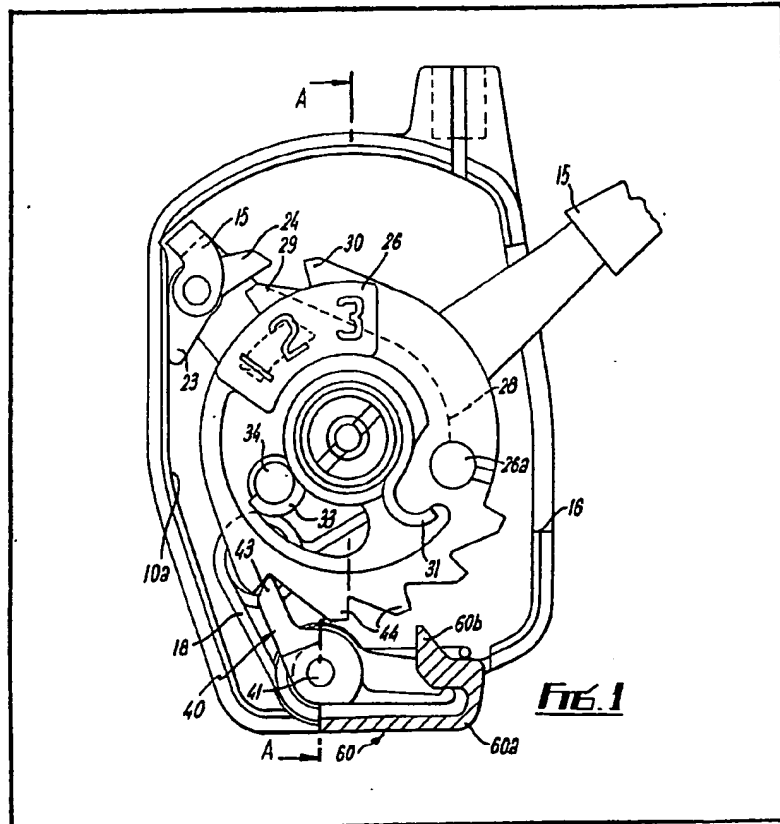
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(54) Improvements in or Relating to Control Means for Elongate Members

(57) Apparatus for moving a cable for changing gear in a bicycle hub gear comprises a drum 26 for supporting a cable, a lever 15 movable to an adjusted position against spring 18 to

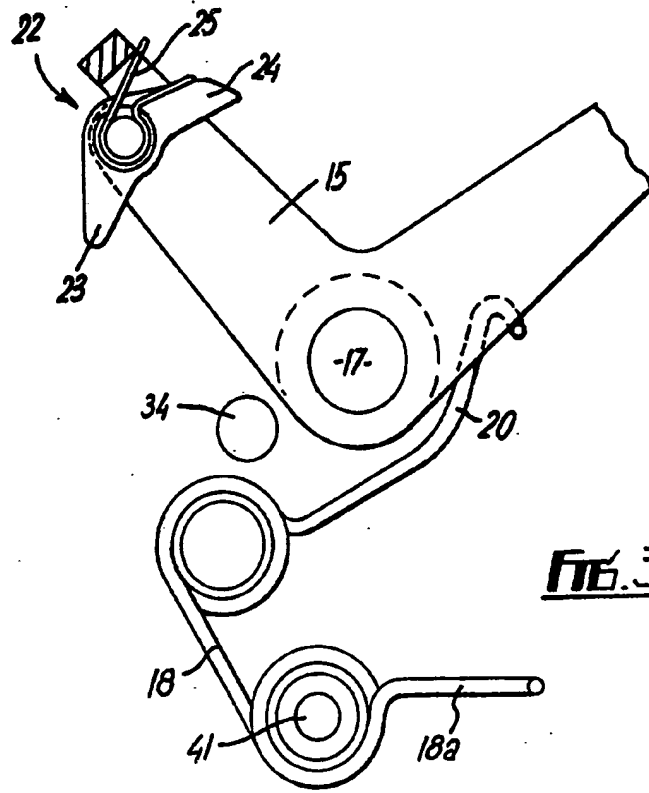
rotate the drum against spring 31 through pawl 24 and teeth 29, 30, and a detent 43 holding the drum in the new position, while the lever 15 returns to its initial position in readiness for a further actuation. The drum can be released to return, one step at a time, to the datum position on depression and release of button 60.



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**FIG. 3**

**SPECIFICATION**  
**Improvements In or Relating to Control Means**  
**for Elongate Members**

5 This invention relates to apparatus for moving  
 an elongate member for a predetermined extent,  
 for example a cable for operating a gear hub of a  
 bicycle or a similar vehicle.

10 According to the invention apparatus for  
 moving an elongate member a predetermined  
 longitudinal extent comprises support means to  
 which the elongate member can be secured,  
 means for moving the support means in a first  
 15 sense from a datum position to a first position to  
 move the elongate member a predetermined  
 longitudinal extent in a first direction, and for  
 moving the support means in the opposite sense  
 to move the elongate member said extent in the  
 opposite direction, means biasing the moving  
 20 means in said opposite sense, and releasable  
 detent means for holding said support means in  
 said first position on release of said moving  
 means.

25 With such an arrangement, when said moving  
 means is operated in the first sense and then  
 released the biasing means returns the moving  
 means to the datum position.

30 There may be a plurality of positions to which  
 the support means can be moved in sequence on  
 repeated operation of said moving means, said  
 releasable detent means holding said support  
 means in each position.

35 The moving means may comprise a first  
 operating member for moving the support means  
 in the first sense and a second operating member  
 for moving the support means in the opposite  
 sense.

40 The first operating member may comprise a  
 lever and the second operating member may  
 comprise a push button.

45 Said means biasing the first operating  
 member in said opposite sense may be spring  
 means.

50 Said detent means may be releasable on  
 operation of said second operating member to  
 allow spring means to return the support means  
 to said datum position and move the elongate  
 member said extent in said opposite direction.

55 Preferably there is further spring means  
 biasing said detent means into engagement with  
 the support means, said second operating  
 member being operable in one sense to release  
 said detent means and to hold said support  
 means against movement in said opposite sense,  
 said further spring means biasing said second  
 60 operating member in another sense so that on  
 release of said second operating member the  
 further spring means operably disengages the  
 second operating member from said support  
 means and the support means moves to the  
 datum position under the action of said spring  
 means.

The detent means may comprise a detent  
 member cooperable with teeth on the support  
 means, said second operating member being

65 cooperable with said teeth.

The first operating member may move the  
 support means through a pawl and ratchet device  
 which is disengaged in the datum position, the  
 pawl being brought into engagement with the  
 70 ratchet by a pawl spring when the first operating  
 member is moved in the first sense.

The support means may comprise a drum  
 mounted for rotation in said first and said  
 opposite senses.

75 In one arrangement the moving means is  
 arranged for moving the support means also in  
 said opposite sense from the datum position to  
 one or more further positions, there being means  
 biasing the moving means towards the datum  
 80 position, and releasable detent means for holding  
 the support means in the or each further position.  
 With such an arrangement it is possible to have a  
 gear change device having a single operating  
 lever which, when the device is mounted on a  
 85 bicycle frame, can be moved up to change gear up  
 and down to change gear down, the lever being  
 returned to a central datum position by the  
 biasing means after each change of gear.

90 The invention includes an apparatus as defined  
 above when used with a cable for changing the  
 gears in a bicycle hub.

95 The invention may be performed in various  
 ways and one specific embodiment with possible  
 modifications will now be described by way of  
 example with reference to the accompanying  
 drawings, in which:—

Figure 1 is a side elevation with part removed  
 and part in section of apparatus according to the  
 invention;

100 Figure 2 is a section on the line A—A of Figure  
 1; and

Figure 3 is a view of part of Figure 1 with  
 certain parts removed.

105 The apparatus is adapted to pull a flexible cable  
 or other inextensible elongate member for a  
 predetermined distance from a datum position  
 and hold the cable in the adjusted position. One  
 particular use of the apparatus is to operate the  
 gear cable of a rear, geared, hub of a bicycle so  
 110 that the gear can be held in a selected ratio.

Referring to the drawings, a two-part housing  
 10 has a boss 11 countersunk to receive a nut 12  
 on a threaded bolt 13 having a head 14 provided  
 with a screw-driver slot.

115 An operating lever 15 extends through a slot  
 16 in one part of the housing 10 and is pivoted  
 on a sleeve 17 surrounding the bolt 13. A torsion  
 spring 18 engages towards one end around a stud  
 19 integral with the part of the housing 10 and at  
 120 the other end 20 engages the lever 15 to bias the  
 lever 15, anti-clockwise as seen in the drawings,  
 to a datum position.

One end of the bell-crank lever 15 carries a  
 pawl 22 having teeth 23, 24 and biased  
 clockwise by pawl spring 25. The spring 25  
 normally holds the tooth 23 against the inner  
 125 peripheral surface 10a of the one part of the  
 housing 10.

A cable drum 26 is rotatably mounted on the

sleeve 17 and has an external groove 28 for receipt of a cable and is provided with two angularly spaced peripheral teeth 29, 30. The drum is axially engaged between the lever 15 and an enlarged head on the sleeve 17. One end of the cable (not shown) has a nipple which is fixed in known manner in an aperture 26a in the drum 26. The drum is engaged by one end 31 of a torsion spring 32 whose other end 33 engages a stud 34 fixed to the one part of the housing 10.

A stud 41 extends between the two parts of the housing 10 and is received at one end into the stud 19. A pawl 40 is rotatably mounted on the stud 41 and has a tooth 43 cooperable with angularly spaced ratchet teeth 44 on the drum 26.

The arrangement shown is for use with a three-gear hub, and the drum carries numerals 1, 2, 3 one at a time of which is visible through a window 50 in the other part of the housing 10. In the position shown, the drum is in gear 3 position.

In order to change from say gear 2 to gear 1 or from gear 3 to gear 2, the lever 15 is manually moved clockwise to rotate the drum clockwise.

This tensions the drum spring 32 but, on release of the manual force, the drum 26 is not returned to the gear 2 or the gear 3 position by the spring 32 because the pawl 43 engages a tooth 44 to prevent anti-clockwise rotation of the drum.

If the drum is in gear 3 position, clockwise rotation of lever 15 causes the pawl tooth 23 to move off the housing surface 10a, and the pawl tooth 24 engages the drum tooth 30 to move the drum with the lever 15 until numeral 2 is visible in the window 50. Movement of the drum pulls the cable to change the gear in the hub. The lever 15 when released returns to the position shown under the action of spring 18.

If the drum is in gear 2 position, an indexing down of the lever 15 similarly causes the pawl tooth 24 to engage the drum tooth 29 to move the drum to bring numeral 1 into view in the window 50 to thus change up from gear 2 to gear 1; and again when the lever 15 is released it is moved back to the position shown under the action of spring 18. The drum 26 is held in the gear 1 position by the pawl 43 engaging another tooth 44, the pawl 43 ratchetting over a tooth 44 during the change of gear.

The angular spacing of the drum teeth 44 determines the amount of rotation of the drum 26, and thus the extent of cable movement, for each clockwise movement of the lever 15, and not the downward movement of the lever 15. The angular movements between successive gears need not all be equal, nor is the invention limited to three gear positions.

In order to change from gear 2 to gear 3 or from gear 1 to gear 2, a separate control is operated. A member 60, having a part 60a extending to the exterior of the housing 10 to act as a push button, is rotatably mounted on the pawl pin 41 and is held in an outward position by an extension 18a of the spring 18. The member 60 has a projecting tooth 60b which, when the

button 60 is depressed inwards against the action of the spring 18, can engage the teeth 44 on the drum 26 to resist anti-clockwise rotation of the drum under the action of the spring 32.

Depression of the button 60 against the effect of the spring 18a engages the tooth 60b with drum teeth 44 to prevent rotation of the drum and also causes the nose 43 of the pawl 40 to disengage from the teeth 44. If the button 60 is now released it is moved outwards by the spring 18 and the drum 26 is released and rotates under the action of the spring 32 until the pawl nose 43 re-engages with a tooth 44 under the action of the spring 18a. The drum is thus indexed by one tooth 44, and it is thus not possible to change down more than one gear for each depression of the button 60. Moreover it is necessary to press and release button 60 each time it is desired to change down a gear.

Thus two separate control operations are required to change gear up and down, operation of the lever 15 to move the drum clockwise and operation of the button 60 to allow the drum to move anti-clockwise. However the two distinct operations could be made using a single operating member—for example operation of a lever in one sense from a datum position to change clockwise and in the opposite sense to change anti-clockwise, the lever when released after each change of gear returning to the datum, central, position under the action of spring means.

Equally there could be a lever to change anti-clockwise and a push button to change clockwise; or there could be two levers, one for changing clockwise and one for changing anti-clockwise.

A two-part circlip-like clamp device 70 can be secured to the housing, for example, as shown, by nut 12, to enable the apparatus to be secured to a tubular frame member of a bicycle, for example the handlebar, using a nut and bolt to tighten the clamp round the tube.

It will be appreciated that the control mechanism described gives optimum operating position for all gear selections, that is the self-return lever has the same, repeatable, initial position and the same angular movement for each gear change. This is particularly advantageous if the control mechanism is for use with a hub of more than three gears (there will be a corresponding number of gear positions in the control mechanism). This is to be contrasted with a conventional control in which if it is to be used with multi-speed hubs of more than three gears, the necessary linear movement of the cable would increase such that the conventional control drum lever would have to be rotated through over 200° making it difficult for a cyclist to operate.

#### Claims

1. Apparatus for moving an elongate member a predetermined longitudinal extent comprising support means to which the elongate member can be secured, means for moving the support means in a first sense from a datum position to a first position to move the elongate member a

- predetermined longitudinal extent in a first direction, and for moving the support means in the opposite sense to move the elongate member said extent in the opposite direction, means biasing the moving means in said opposite sense, and releasable detent means for holding said support means in said first position on release of said moving means.
2. Apparatus as claimed in claim 1, in which repeated operation of said moving means in said first sense moves the support means to a plurality of positions, said releasable detent means holding said support means in each position.
3. Apparatus as claimed in claim 1 or claim 2, in which the moving means comprises a first operating member for moving the support means in the first sense and a second operating member for effecting movement of the support means in the opposite sense.
4. Apparatus as claimed in claim 3, in which the first operating member is a lever.
5. Apparatus as claimed in claim 3 or claim 4, in which the second operating member is a push button.
6. Apparatus as claimed in any one of the claims 3 to 5, in which the means biasing the first operating member in said opposite sense comprises spring means.
7. Apparatus as claimed in any of claims 3 to 6, in which said detent means is releasable on operation of said second operating member to allow spring means to return the support means to said datum position and move the elongate member said extent in said opposite direction.
8. Apparatus as claimed in claim 7, including further spring means biasing said detent means into engagement with the support means, said second operating member being operable in one sense to release said detent means and to hold said support means against movement in said opposite sense, said further spring means biasing said second operating member in another sense so that on release of said second operating member the further spring means operably disengages the second operating member from said support means and the support means moves to the datum position under the action of said spring means.
9. Apparatus as claimed in any one of claims 3 to 8, in which the detent means comprises a detent member cooperable with teeth on the support means, said second operating member being cooperable with said teeth.
10. Apparatus as claimed in any one of the preceding claims 3 to 9, in which the first operating member moves the support means through a pawl and ratchet device which is disengaged in the datum position, the pawl being brought into engagement with the ratchet by a pawl spring when the first operating member is moved in the first sense.
11. Apparatus as claimed in any one of the preceding claims, in which the support means comprises a drum mounted for rotation in said first and said opposite senses.
12. Apparatus as claimed in claim 1, including means biasing the support means in the opposite sense.
13. Apparatus as claimed in claim 1, in which the moving means is arranged for moving the support means also in said opposite sense from the datum position to one or more further positions, there being means biasing the moving means towards the datum position, and releasable detent means for holding the support means in the or each further position.
14. Apparatus for moving an elongate member substantially, as hereinbefore described with reference to and as illustrated in the accompanying drawings.
15. Apparatus as claimed in any one of the preceding claims, when associated with a cable for changing the gears in a bicycle hub.