

PATENT SPECIFICATION

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(54) A CONTROL LINKAGE

(71) We, CATERPILLAR TRAC-
 TOR CO., a corporation organised and
 existing under the laws of the State of
 California, United States of America, of 100
 5 N.E. Adams Street, Peoria, Illinois, 61629,
 United States of America, do hereby declare
 the invention, for which we pray that a
 patent may be granted to us and the method
 by which it is to be performed, to be particu-
 10 larly described in and by the following
 statement:-

This invention relates to a manually oper-
 ated control linkage and is particularly
 directed toward a device in which a first
 15 actuator may be used to preposition a con-
 trol arm at a desired setting while a second
 actuator may temporarily reposition the
 control arm at a different setting without
 disturbing the setting achieved by the first
 20 actuator. The control mechanism includes
 an anti-creep device so that the selected pos-
 ition of the first actuator is not disturbed by
 vibration or shocks which might otherwise
 dislodge the controlled parts from their
 25 locked positions.

The invention is particularly applicable to
 various devices where a manually actuated
 lever is employed to adjust a mechanism
 linkage or the like at a predetermined posi-
 30 tion while retaining the capability to reposi-
 tion the mechanical linkage temporarily. It
 is particularly applicable to engine govern-
 ors and it is shown and described herein as
 so used for purposes of illustration.

It is conventional practice to employ a
 35 governor to maintain a constant engine
 speed under varying load conditions particu-
 larly in heavy earthmoving equipment,
 where generally a compression type ignition
 40 engine is used. Various types of governors

used in such applications are generally
 well-known in the art. A governor repre-
 sentative of the type herein considered is
 to be found in our U.S. Patent Specification
 No. 2,961,229. Generally, governors of the
 type herein described utilize a spring loaded
 device and a control lever to tension the
 governor spring. Particular tensioning of the
 governor spring determines the operating
 speed of the engine. In the operation of
 heavy earthworking equipment it is desir-
 able to position the governor setting at a
 particular engine speed to produce a particu-
 lar operating speed over the ground while
 retaining a capability to slow the engine for
 brief periods without disturbing the gover-
 nor setting.

Various schemes have been utilized to
 accomplish such a constant speed setting,
 but in most cases the schemes have proved
 complicated and in some cases cumbersome.
 In the operation of heavy construction
 equipment, it is extremely desirable to pro-
 vide an operating scheme for the vehicle
 which allows the operator to devote his
 attention to the job at hand. Thus, simplicity
 of controls is of great importance. Use of the
 more complex governor control systems pre-
 60 sently available may require diversion of
 operator attention from the task at hand.
 Furthermore, these complex systems gener-
 ally have a high initial cost. Therefore, it is
 desirable to provide a governor control link-
 age which is of the simplest design and
 requires the least amount of operator atten-
 65 tion.

According to the invention a control link-
 age comprises a housing; a first shaft rotat-
 ably mounted in the housing; a second shaft
 rotatably mounted in the housing; a coupl-
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ing associated with the housing and coupling the first shaft to the second shaft to allow rotation of the second shaft relative to the housing only upon rotation of the first shaft; a first lever connected with the second shaft for rotation therewith; a second lever rotatably mounted about the second shaft; a third lever rotatably mounted about the first shaft; the first and third levers each being engageable with the second lever for rotating the second lever in a first direction relative to the second shaft; and resilient means associated with the second shaft and the first and second levers for urging the second lever in the opposite direction to engage the first lever in a predetermined position relative to the first lever.

This invention provides a simply operated and easily constructed governor control linkage (with the second lever connected with the governor) which permits an operator to manually select a desired engine operating speed (with a first actuator connected to the first shaft) and retain this desired operating speed setting under varying operating requirements. A second actuator (connected with the third lever) is provided for the operator to decelerate the engine from the preset operating speed for brief periods of time without disturbing the aforescribed setting. Upon release of the second actuator, the engine speed can return to the preset setting where it will continue to operate until the first actuator is repositioned, or the second actuator is again used to temporarily vary engine speed.

The invention also provides a linkage which permits positioning of the governor control linkage as described and insures that vibration or shocks will not dislodge the control parts from their locked positions.

The linkage is a simply operated arrangement requiring minimum operator attention and can be economically manufactured.

One example of a linkage according to the invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is an elevation view of the linkage shown in a first position;

Figure 2 is an end elevation of the same linkage shown in Figure 1 in a second position;

Figure 3 is a front elevation partly in section of a portion of the linkage shown in Figure 1 particularly showing the coupling;

Figure 4 is a view of the linkage depicted in Figure 1 with the decelerator pedal in the deceleration position;

Figure 5 is an end elevation view taken at the line V-V in Figure 3; and

Figure 6 is a sectional view taken at line VI-VI of Figure 3.

Shown in Figure 1 is a control linkage 10

which is adaptable for use in an engine driven vehicle controlled by an engine governor. The control linkage 10 is particularly applicable for setting an engine governor to operate the engine at a predetermined speed while allowing the operator to temporarily decelerate the engine without influencing the operational setting of the governor. A hand operated first actuator means such as engine governor control lever 12 (hereinafter referred to as control lever 12) is positioned convenient to the operator station to allow the operator to set a predetermined governed engine speed. In the embodiment described herein the control lever 12 is movable from a first position as illustrated in Figure 1 to a second position as illustrated in Figures 2 and 4 to obtain a higher governor setting. Control lever 12 is pivoted at a pin 14 affixed to the control linkage bracket 15 which in turn is affixed to the structure of the vehicle (not shown). Associated with control lever 12 is a crank 16 extending outwardly from pin 14 and movable in response to movement of control lever 12. It should be noted that control lever 12 and crank 16 may be integrally formed as a single part to form a conventional bell crank or they may in turn be separately formed parts and associated upon assembly in a fixed relation. Crank 16 has affixed at the end distal of pin 14, a link 18 which in turn is affixed to a lever 20, the lever 20 being fixedly associated with a first shaft 22 rotatably mounted in housing 24 which in turn is affixed to bracket 15. Referring now to Figure 3, it can be seen that lever 20 is affixed to first shaft 22 by a conventional key means 25, other means for affixing lever 20 to first shaft 22 are equally applicable. Housing 24 is comprised of a cylindrically shaped first member 26 having a smaller cylindrical extension 2 extending axially therefrom in which first shaft 22 is rotatably mounted. Housing 24 also includes annular disc shaped second member 28 in which a second shaft 30 is rotatably mounted. Second member 28 is affixed to first member 26 to form a cylindrical cavity 35. First shaft 22 and second shaft 30 are axially aligned in an abutting relation interior of cavity 35. The first and second shafts are formed with axial wells 31 and 33 respectively in which a pin member 32 is positioned to insure rotational alignment and a second bearing point for second shaft 30.

A plate 34, which forms a portion of a coupling means 27 for rotatively associating first shaft 22 with second shaft 30, is disposed within cavity 35 and is secured to the inner end of shaft 22 for rotative movement therewith. A locking member 36 forming a second portion of coupling means 27 is also disposed within cavity 35 in a face to face relationship with plate 34. Locking member

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36 is fixed to the inner end of second shaft 30 for rotative movement therewith and is provided with a pair of cam surfaces 38. As shown in Figure 6, a pair of wedging members 40 are carried within the space defined by cam surfaces 38 and the inner wall of the cylindrical shaped first member 26. While the wedging members 40 are shown as rollers, the shape is not essential to the function they perform and balls or wedging means of other configurations may be used as desired. The wedging means are jammed into the space between the cam surfaces and the inner wall of the first member to prevent relative movement between these parts in either direction. The wedging members are normally held in their jammed position by means of springs 42 carried in recesses 43 formed in locking member 36. With this arrangement the wedging action of each of the wedging members will prevent relative movement in one direction between the cylindrical surface and the cam surface with which it engages but will permit movement in the opposite direction. With two wedging members arranged in the manner shown, relative movement in either direction is prevented.

The wedging members 40 are unlocked by means of pins 45 carried by plate 34. The pins 45 project into the space between the locking member 36 and the inner wall of first member 26 so that upon movement of first shaft 22 by actuation of lever 20 one of the pins engages one of the wedging members to dislodge it from its jammed position. Further movement of lever 20 by control lever 12 causes compression of spring 42 associated with that locking means and continued movement of the lever affects rotation of the locking member 36 with relation to the housing. This rotative movement is transmitted through second shaft 30 to a first lever means such as lever 47 affixed thereto. When movement of the lever 20 is stopped, the spring 42 returns the wedging member 40 into its normal jammed position and the parts are again locked against relative rotation.

During operation machinery vibration or in the case of an engine installation, engine vibration may cause the lever 20 to creep. This circumferential movement of the lever 20 causes rotation of the associated first shaft 22, plate 34 and unlocking pins 45. When one of the pins 45 is vibrated into contact with the corresponding wedging member 40, the wedging member is urged toward the unlocked position with the result that locking member 36 and the associated parts are allowed to move. This movement may cause undesirable fluctuations in the speed of the machinery being governed due to the variations and tensions of springs interconnecting this device with an engine

governor. In order to prevent any tendency of the control to creep due to oscillatory vibrations, a dampening member 46 is positioned within a recess 48 formed in abutting faces of plate 34 and locking member 36. As shown in Figure 6, the ends of damping member 46 overlap the plate and the locking member, directly and resiliently oppose any relative movement induced by vibration. The force of the damping member is easily overcome when the lever 20 is actuated.

Referring now to Figure 3, lever 47 is affixed to shaft 30 by appropriate means such as a key 49 insuring rotation of lever 47 upon rotation of shaft 30. Rotatably mounted about shaft 30 is a second lever means such as a second lever 51 which is adapted to be linked to a machine control such as an engine governor (not shown) through link means such as a link 52. Second lever 51 has integrally formed therewith a plate member 54 which extends transversely of the lever in a generally parallel arrangement with the first shaft 22 and a second shaft 30, while first lever 47 is formed with a lateral extension 56 engageable with plate 54. Resilient torsion means such as helical spring 58 is positioned relative shaft 30 and plate 54 so that one end 59 is biased against lateral extension 56 while the other opposite end 60 is biased against plate member 54. The biasing and load on spring 58 is sufficient to hold lateral extension 56 in engagement with plate 54, thus allowing the first lever and the second lever to rotate together.

Rotatably mounted about shaft 22 and in the embodiment depicted in Figure 3 about the cylindrical extension 29 of first member 26 is a third lever means such as third lever 62 which terminates in a second actuator such as pedal 63 distal of the housing 26. Third lever 62 is formed with a lateral extension 64 which is engageable with plate member 54. In this embodiment, lateral extension 64 is formed with a threaded bore 65 in which a bolt 66 may be threadably engaged to adjustably position lever 62 relative plate 54.

Referring now to Figure 1, control lever 12 and pedal 63 are shown in their first positions relative bracket 15 while in Figure 2 the control lever and pedal have been moved to second positions relative bracket 15. Assuming the first position indicated in Figure 1 is the idle position and the second position shown in figure 2 is the full speed position, then with control lever 12 in the second position pedal 63 is available to decelerate the engine without disturbing the position of control lever 12 and second shaft 30 due to coupling means 27. Coupling means 27 interconnecting first shaft 22 and second shaft 30, insures that the second

shaft is rotatable only upon rotation of the first shaft. Further, it can be seen in Figure 2 that second lever 51, which is resiliently biased to first lever 47 and thus follows the motion of second shaft 30, moves link 52 leftwardly, as seen in Figure 2 to adjust the setting of a control such as an engine governor. It should be pointed out that in movement of second lever 51 from a first position shown in Figure 1 to the second position shown in Figure 2, third lever 62 because of the lateral extension 64 and bolts means 66 follows the motion of second lever 51. Referring to Figure 4 pedal 63 is shown returned to its first or idle position as indicated in Figure 1 while control lever 12 and second lever 51 are in the second position of full speed position. It is pointed out that reference to control lever 12 is utilized for convenience in orienting lever 20, movement of control lever 12 will of course move lever 20 from the first to the second position as indicated in Figures 1 and 2. Referring now to Figure 5, lever 62 which serves as the supporting member for pedal 63 and lever 51 are shown in the first position as indicated in Figure 4 while the remainder of the control device is shown in the second position. Particularly, lever 47 which is integrally fixed with shaft 30 is shown in its second position. It can be seen in Figure 5 that plate 54 is no longer in engagement with lateral extension 56 thus the spring 58 has been loaded by depressing pedal 62 separating the first end 59 from the second end 60 of spring 58. Depression of pedal 63 has carried plate member 54 and the integrally fixed lever 51 in a clockwise direction in Figure 5 (counterclockwise in Figure 4). This movement may be used to 'decelerate' a governor affixed thereto by link 52. Release of pedal 63 will return both pedal 63 and lever 51 to the second position as indicated in Figure 2. Return of lever 51 to the second position returns the engine control or governor to the condition set by control lever 12 before depression of pedal 63. Thus it can be seen that temporary deceleration of an engine through the governor may occur without disturbing the setting of the engine governor control lever.

Although this invention has been described with particular reference to the setting of an engine governor, it is equally applicable to any other device which requires a particular setting and a means for temporarily changing that setting.

WHAT WE CLAIM IS:-

1. A control linkage comprising a housing; a first shaft rotatably mounted in the housing; a second shaft rotatably mounted in the housing; a coupling associated with the housing and coupling the first shaft to the second shaft to allow rotation of the second shaft relative to the housing only upon

rotation of the first shaft; a first lever connected with the second shaft for rotation therewith; a second lever rotatably mounted about the second shaft; a third lever rotatably mounted about the first shaft; the first and third levers each being engageable with the second lever for rotating the second lever in a first direction relative to the second shaft; and resilient means associated with the second shaft and the first and second levers for urging the second lever in the opposite direction to engage the first lever in a predetermined position relative to the first lever.

2. A control linkage according to claim 1 further comprising a fourth lever connected with the first shaft for rotating the first shaft.

3. A control linkage according to claim 1 or claim 2, further comprising adjustable engagement means integrally formed with the third lever for adjustably positioning the third lever relative to the second lever.

4. A control linkage according to any one of claims 1 to 3, wherein the second lever has a plate integrally formed therewith for engagement with the first lever and the third lever.

5. A control linkage according to claim 4, wherein the resilient means comprises a helical torsion spring having a first end engaging the first lever and a second end engaging the plate so that the plate is urged relatively toward the first lever.

6. A control linkage according to any one of claims 1 to 5, wherein the coupling means comprises a plate member affixed to the first shaft for rotation therewith, a locking member fixed to the second shaft for rotation therewith and in face to face relation with the plate member, the plate member and the locking member being rotatable in the housing and the locking member defining first and second cam surfaces; a first wedging member and a second wedging member positioned between the first cam surface and the second cam surface respectively, and the housing; a first resilient means and a second resilient means urging the first wedging member and the second wedging member respectively into locking engagement with the cam surface and the housing; a first pin and a second pin each respectively engaged with the plate member and rotatable therewith; the first pin disengaging the first wedging member on rotation of the first shaft in a first direction, and the second pin disengaging the second wedging member upon rotation of the first shaft in the opposite direction.

7. A control linkage according to claim 6, further comprising a damping member engaged with the plate and the locking member to damp out vibratory motion between the plate and the locking member.

shaft is rotatable only upon rotation of the first shaft. Further, it can be seen in Figure 2 that second lever 51, which is resiliently biased to first lever 47 and thus follows the motion of second shaft 30, moves link 52 leftwardly, as seen in Figure 2 to adjust the setting of a control such as an engine governor. It should be pointed out that in movement of second lever 51 from a first position shown in Figure 1 to the second position shown in Figure 2, third lever 62 because of the lateral extension 64 and bolts means 66 follows the motion of second lever 51. Referring to Figure 4 pedal 63 is shown returned to its first or idle position as indicated in Figure 1 while control lever 12 and second lever 51 are in the second position of full speed position. It is pointed out that reference to control lever 12 is utilized for convenience in orienting lever 20, movement of control lever 12 will of course move lever 20 from the first to the second position as indicated in Figures 1 and 2. Referring now to Figure 5, lever 62 which serves as the supporting member for pedal 63 and lever 51 are shown in the first position as indicated in Figure 4 while the remainder of the control device is shown in the second position. Particularly, lever 47 which is integrally fixed with shaft 30 is shown in its second position. It can be seen in Figure 5 that plate 54 is no longer in engagement with lateral extension 56 thus the spring 58 has been loaded by depressing pedal 62 separating the first end 59 from the second end 60 of spring 58. Depression of pedal 63 has carried plate member 54 and the integrally fixed lever 51 in a clockwise direction in Figure 5 (counterclockwise in Figure 4). This movement may be used to 'decelerate' a governor affixed thereto by link 52. Release of pedal 63 will return both pedal 63 and lever 51 to the second position as indicated in Figure 2. Return of lever 51 to the second position returns the engine control or governor to the condition set by control lever 12 before depression of pedal 63. Thus it can be seen that temporary deceleration of an engine through the governor may occur without disturbing the setting of the engine governor control lever.

Although this invention has been described with particular reference to the setting of an engine governor, it is equally applicable to any other device which requires a particular setting and a means for temporarily changing that setting.

WHAT WE CLAIM IS:-

1. A control linkage comprising a housing; a first shaft rotatably mounted in the housing; a second shaft rotatably mounted in the housing; a coupling associated with the housing and coupling the first shaft to the second shaft to allow rotation of the second shaft relative to the housing only upon

rotation of the first shaft; a first lever connected with the second shaft for rotation therewith; a second lever rotatably mounted about the second shaft; a third lever rotatably mounted about the first shaft; the first and third levers each being engageable with the second lever for rotating the second lever in a first direction relative to the second shaft; and resilient means associated with the second shaft and the first and second levers for urging the second lever in the opposite direction to engage the first lever in a predetermined position relative to the first lever.

2. A control linkage according to claim 1 further comprising a fourth lever connected with the first shaft for rotating the first shaft.

3. A control linkage according to claim 1 or claim 2, further comprising adjustable engagement means integrally formed with the third lever for adjustably positioning the third lever relative to the second lever.

4. A control linkage according to any one of claims 1 to 3, wherein the second lever has a plate integrally formed therewith for engagement with the first lever and the third lever.

5. A control linkage according to claim 4, wherein the resilient means comprises a helical torsion spring having a first end engaging the first lever and a second end engaging the plate so that the plate is urged relatively toward the first lever.

6. A control linkage according to any one of claims 1 to 5, wherein the coupling means comprises a plate member affixed to the first shaft for rotation therewith, a locking member fixed to the second shaft for rotation therewith and in face to face relation with the plate member, the plate member and the locking member being rotatable in the housing and the locking member defining first and second cam surfaces; a first wedging member and a second wedging member positioned between the first cam surface and the second cam surface respectively, and the housing; a first resilient means and a second resilient means urging the first wedging member and the second wedging member respectively into locking engagement with the cam surface and the housing; a first pin and a second pin each respectively engaged with the plate member and rotatable therewith; the first pin disengaging the first wedging member on rotation of the first shaft in a first direction, and the second pin disengaging the second wedging member upon rotation of the first shaft in the opposite direction.

7. A control linkage according to claim 6, further comprising a damping member engaged with the plate and the locking member to damp out vibratory motion between the plate and the locking member.



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8. A control linkage according to claim 1, substantially as described with reference to the accompanying drawings. wherein the second lever is connected with an engine speed governor.

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5 9. A control linkage according to any one of claims 1 to 8, fitted to a vehicle to control the speed of the vehicle engine.

10. A vehicle having a control linkage according to any one of claims 1 to 9,

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15

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