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MECHANICAL CONTROL MECHANISM

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Fig. 1.

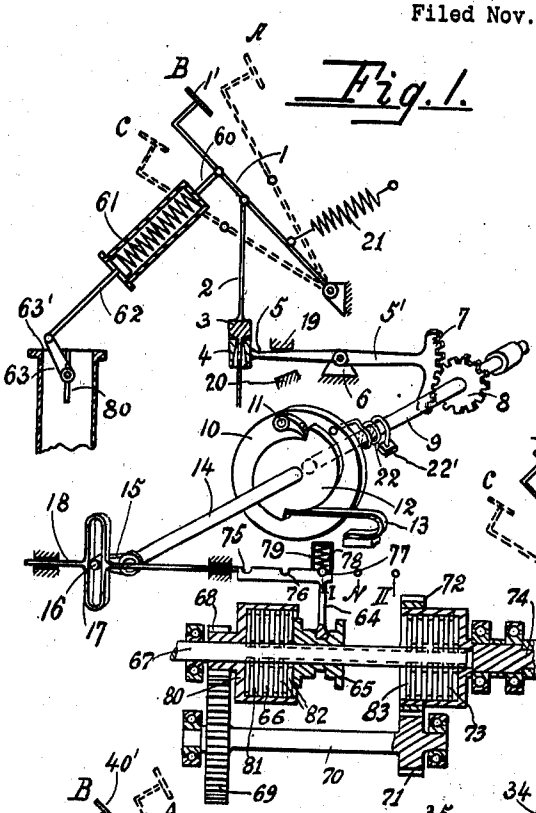


Fig. 2.

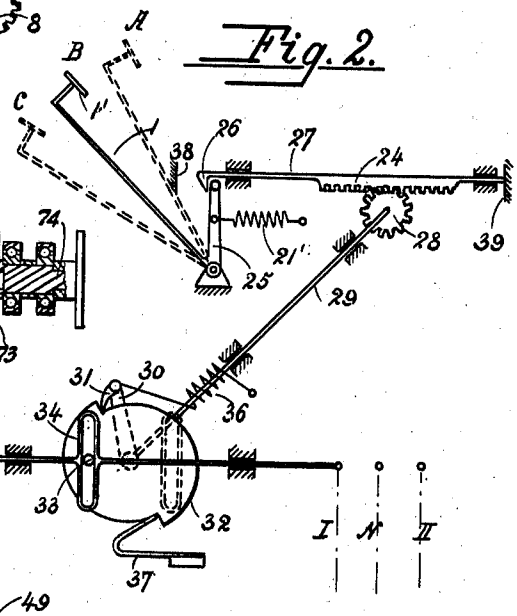
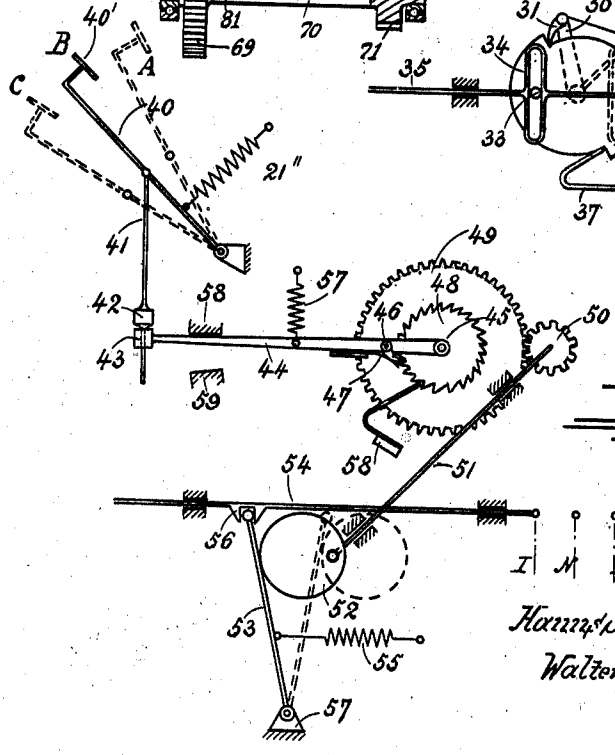


Fig. 3.



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MECHANICAL CONTROL MECHANISM

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6 Claims. (Cl. 74—472)

The present invention relates to a mechanism for operating a horizontally movable rod by means of a foot pedal, more particularly to a mechanism as specified in which said foot pedal is also used for controlling the gas supply to an internal combustion engine which drives a variable speed transmission in which two different speed transmissions can be set by means of said horizontally movable rod.

An object of the present invention is to provide a mechanism in which, by operating a foot pedal, the fuel supply to an internal combustion engine as well as to a speed changing mechanism is controlled and any desired speed can be obtained independently from the fuel control merely by operating said pedal and without manipulation of a handle or the like.

Another object of the present invention resides in the provision of a mechanism as set forth in the paragraph next above in which the operation of the pedal takes place in the conventional manner and no unusual motions of the foot for operating the pedal, such as tilting and the like, are required.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawing which, by way of illustration, shows what we now consider to be a preferred embodiment of our invention.

In the drawing:

Fig. 1 is a diagrammatic layout of a mechanism according to the present invention.

Fig. 2 is a diagrammatic layout of a modified mechanism according to the present invention.

Fig. 3 is a diagrammatic layout of another modification of the present invention.

Referring more particularly to Fig. 1 of the drawing, 1 represents a lever to which a pedal 1' is rigidly connected. To this lever, a gas throttle 80 of a motor driving a motor car or rail car or the like is connected by means of link 60, spring 61, rod 62, and crank 63. The position of pedal 1' designated by letter A corresponds to light running condition of the motor, i. e., with the gas supply almost completely throttled. The position of the pedal designated by letter B coincides with the full load condition of the motor, i. e., when the gas throttle is wide open. At this point, a variable speed transmission connected with the motor may be set at first speed. The operator now desires to leave the throttle wide open and change over to second speed. For this purpose, all he has to do with a mechanism according to the present invention is to further depress the gas pedal from position B into position C. The gas throttle is thereby not further moved because its lever 63 touches abutment 63' and link 60 compresses spring 61.

Rod 2 which is linked to lever 1 slides in a slide 4 which is rigidly connected to two-arm lever 5, 5' which lever swings about fulcrum 6. When gas pedal 1' is depressed and reaches position B, block 3 which is rigidly connected with rod 2 abuts slide 4 and moves lever 5, 5' in counterclockwise direction. Arm 5' is provided with a toothed segment 7 which is in mesh with gear wheel 8. To wheel 8, a shaft 9 is rigidly connected which carries disc 10 to which pawl 11 is movably connected. Pawl 11 engages a tooth of ratchet wheel 12 which is rigidly connected to shaft 14. Upon rotation of shaft 9 and disc 10, ratchet wheel 12 and shaft 14 are also rotated and this against the tension of spiral spring 22 which is unwound at such operation. To the end of shaft 14, a crank 15 is connected which carries crank pin 16. This pin slidably moves in slot 17 which is part of rod 18. To rod 18, fork 64 operating clutch engaging member 65 is connected which, in the position shown in Fig. 1, is holding clutch 66 in engaged position. Clutch 66 consists substantially of two parts, one of which is designated by numeral 80 and carries a toothed wheel 68 and clutch discs 81, which are axially but not rotatably movable within part 80, and rotates freely on shaft 67. The other part comprises friction discs 82, which are axially movable but not rotatable on shaft 67. Only when clutch 66 is engaged does said part carrying wheel 68 rotate with shaft 67. Wheel 68 is constantly in mesh with gear wheel 69 which is rigidly connected with shaft 70. To the latter, another toothed wheel 71 is rigidly connected, which is constantly in mesh with toothed rim 72 of that part of clutch 73 which is rigidly connected with shaft 74. When clutch 66 is engaged, power is transmitted from shaft 67 by means of gear wheels 68, 69, auxiliary shaft 70, and gear wheels 71, 72, the latter forming part of clutch 73, to shaft 74. Upon rotation of crank 15 by 180° which takes place when pedal 1' moves from position B to position C, slot 17, rod 18, and clutch engaging member 65 are moved to the right, whereby clutch 66 is disengaged and clutch 73 is engaged. Shaft 67 is then directly connected with shaft 74 and the transmission is set for second speed. In this case, wheels 68, 69, shaft 70, and wheels 71 and 72 are in light running condition. Power is then transmitted from shaft 67 through elements 83, which correspond to ele-

ments 81, to elements 84, which correspond to elements 82 in clutch 66, to the shaft 74. Upon rotation of discs 10 and 12 by 90°, notch 76 of rod 18 cooperates with ball 78, and clutch engaging member 65 is in neutral position. No power is then transmitted from shaft 67 to shaft 74. An abutment 20 is provided for lever 5 which limits the movement of pedal 1 beyond position C.

If the operator now releases pedal 1', lever 1 is pulled backwards by means of spring 21 which had been expanded when lever 1 was depressed. With lever 1, rod 2 and with it block 3 are pulled upwards, whereby slide 4 follows block 3 because lever 5, 5' is turned in clockwise direction by tooth wheel 8 connected to shaft 9, which latter is turned counterclockwise by the recoiling spring 22. One end of spring 22 is connected to a stationary part 22' and the other end to disc 10. Ratchet wheel 12, which is held in position by means of spring 13, shaft 14, crank 15, rod 18, and clutch operating member 65 remain in position and clutch 73 remains engaged. This all takes place when, upon clockwise movement of lever 1, pedal 1' reaches position B. If lever 1 is further turned in clockwise direction, lever 5 rests against abutment 19 and block 3 leaves slide 4. The gas throttle then closes until it is almost fully closed when pedal 1' is in the position marked A.

If pedal 1' is again depressed beyond position B, clutch operating member 65 is moved to the left, whereby clutch 73 is disengaged and clutch 66 engaged. Should the operator not be satisfied with the speed set by rod 18, he permits pedal 1' to move from position C back to position B and presses the pedal once more to position C; thereby the other speed is set. It may be desirable to indicate the position of rod 18 particularly when it is in a position which indicates neutral position of the clutch operating member 65. This can be accomplished by providing rod 18 with notches 75, 76, and 77 into which a ball 78 is resiliently pressed by means of a spring 79.

In the embodiment of the present invention which is shown in Fig. 2, instead of lever 5, 5' and segment 7 of the mechanism shown in Fig. 1, an axially movable rod 27 is used which is provided with a projection 26 which is engaged by the end of an arm 25 which is rigidly connected to lever 1. Pedal 1' of the mechanism shown in Fig. 2 must be depressed against the tension of spring 21'. Rod 27 is provided with a rack 24 which engages gear wheel 28 which corresponds to wheel 8 in Fig. 1. The movement of rod 27 to the right is limited by abutment 39 which corresponds to abutment 19 in Fig. 1. Movement of rod 27 to the left is limited by abutment 38 which corresponds to abutment 20 in Fig. 1. Wheel 28 is rigidly connected with shaft 29 to which an arm 30 is fixed which carries pawl 31. When pedal 1' is depressed, shaft 29 turns counterclockwise and winds up spring 36. Pawl 31 engages ratchet wheel 32 which is provided with pin 33 which slidingly moves in slot 34 which is part of rod 35. Rod 35 corresponds to rod 18 in Fig. 1 and may operate a gear changing member, for example, a clutch operating member as is shown in Fig. 1. To lever 1, a gas throttle may be connected in the same manner as shown in Fig. 1.

Upon depression of pedal 1' in Fig. 2 from position B to C, arm 30 and ratchet wheel 32 are turned by 180° and rod 35 is pushed from its leftmost position, which is shown in Fig. 2, to its rightmost position. If pedal 1' is depressed to a position which is intermediary B and C, then disc 32 is revolved by 90° only, and rod 35 is pushed to the intermediary or neutral position which is designated by the letter N. Upon releasing pedal 1', lever 1 turns clockwise due to the action of spring 21'. Projection 26 and rod 27 follow arm 25 due to the action of spring 36 which then unwinds, whereas wheel 32 and rod 35 remain in position as is the case with wheel 12 and rod 18 at the same pedal operation. Ratchet wheel 32 is definitely held in position by means of plate spring 37 which engages one of its teeth.

In the embodiment of our invention according to Fig. 3, lever 40 corresponds to lever 1 in Fig. 1, rod 41 to rod 2, block 42 to block 3, slide 43 to slide 4, lever 44 to lever 5, abutments 58 and 59 to abutments 19 and 20, respectively, and fulcrum 45 to fulcrum 6 of Fig. 1. Lever 44 carries a pawl 46 which is kept in engagement with ratchet wheel 48 by means of spring 47. To ratchet wheel 48, a gear wheel 49 is connected which engages gear wheel 50 which is rigidly connected to shaft 51. The latter carries a cam member 52 which, in the embodiment shown in Fig. 3, has the shape of a disc, the contour of which is in sliding engagement with lever 53 which is held to said disc by means of spring 55. The free end of lever 53 engages a notch-like part 56 of rod 54 and, when swinging about fulcrum 57, moves rod 54 axially. To rod 54, a gear changing means, for example, a clutch operating member as shown in Fig. 1 may be connected. To lever 40, a gas throttle may be connected in the same manner as is throttle 80 in Fig. 1.

The mechanism shown in Fig. 3 operates as follows: when pressing lever 40 down against the tension of spring 21'' so that the pedal 40' moves from position A to position B, rod 41 moves freely in slide 43. When the pedal reaches position B, block 42 abuts against slide 43 and lever 44 is pressed downwards against the action of spring 57. Pawl 46 then turns ratchet wheel 48 and tooth wheel 49 in counterclockwise direction, whereby wheel 50 and shaft 51 are turned clockwise. Disc 52 then swings over to the right also in clockwise direction followed by lever 53 and rod 54. When pressing pedal 40' from position B to position C', disc 52 is turned by 180° and rod 54 moves from its leftmost position to its rightmost position. By depressing lever 40 to a position which is intermediary B and C, the right end of lever 54 moves to the position designated by letter N, which is neutral position. When releasing pedal 40', lever 40, due to the action of spring 21'', moves clockwise followed by rod 41 and lever 44 due to the action of spring 57. Ratchet wheel 45 is held in position by plate spring 58 which engages one of its teeth, and also shaft 51 and rod 54 remain in their position as does rod 18 in Fig. 1 when pedal 1' is released.

While we believe the above described embodiments of our invention to be preferred embodiments, we wish it to be understood that we do not desire to be limited to the exact details of design and construction shown and described, for obvious modifications will occur to a person skilled in the art.

What is claimed is:

1. A control apparatus comprising pedal means, actuating means, a one-way coupling comprising a driving member and a driven member, a first set of connecting means connected to and connecting said pedal means and said driving member, and a second set of connecting means connected to and connecting said driven member and

said actuating means, said members of said coupling being so arranged that said first set of connecting means can move in one direction independently from said second set of connecting means.

2. A control apparatus comprising pedal means, fuel supply control means connected with said pedal means, speed changing means comprising operating means, connecting means operatively interconnecting said pedal means and said operating means, said connecting means comprising a one-way lost-motion coupling adapted to transmit only part of the motion of said pedal means to said operating means, and another one-way coupling interposed in said connecting means and in series with said first mentioned coupling with respect to the flow of the power exerted on said pedal means from said pedal means to said operating means.

3. A control apparatus comprising pedal means, fuel supply control means connected with said pedal means, speed changing means comprising operating means, connecting means operatively interconnecting said pedal means and said operating means, said connecting means comprising a one-way lost-motion coupling adapted to transmit only part of the motion of said pedal means to said operating means, another one-way coupling interposed in said connecting means and in series with said first mentioned coupling with respect to the flow of power exerted on said pedal means from said pedal means to said operating means, a member connecting said one-way lost-motion coupling with said other coupling, and resilient means connected with said member and adapted to store up energy when said member is moved in one direction, due to the action of said pedal means, and to move said member in opposite direction independently from said pedal means by means of the stored up energy.

4. In a control apparatus, pedal means, a lost motion connection composed of two members, one of said members being connected to said pedal, a one-way coupling having a driving member and a driven member, means connecting said driving member to the other member of said lost motion connection, actuating means, means connecting the driven member of said one-way coupling with said actuating means, said drive and driven members of said one-way coupling being so arranged that said first mentioned connecting means can move in one direction independently from said second mentioned connecting means.

5. In a control apparatus, pedal means, a lost motion connection composed of two members, one of said members being connected to said pedal, a one-way coupling having a driving member and a driven member, means connecting said driving member to the other member of said lost motion connection, actuating means, means connecting the driven member of said one-way coupling with said actuating means, said drive and driven members of said one-way coupling being so arranged that said first mentioned connecting means can move in one direction independently from said second mentioned connecting means and power accumulating means connected with said first mentioned connecting means and being adapted to be loaded upon operation of said pedal means and to operate said first mentioned connecting means when said pedal means are released.

6. In a control apparatus, pedal means, a lost motion connection composed of two members, one of said members being connected to said pedal, a one-way coupling having a driving member and a driven member, means connecting said driving member to the other member of said lost motion connection, actuating means, means connecting the driven member of said one-way coupling with said actuating means, said drive and driven members of said one-way coupling being so arranged that said first mentioned connecting means can move in one direction independently from said second mentioned connecting means, the member of said lost motion connection which is connected with said pedal being adapted to freely move for a predetermined distance before it engages the other member of said lost motion connection when said pedal means are actuated, whereby said pedal means can be moved for a predetermined distance before said actuating means are actuated.

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