March 17, 1953 R. R. ROBINSON ET AL 2,631,837

CENTRIFUGAL TYPE ENGINE GOVERNOR HAVING HYDRAULICALLY ASSISTED SPEED SETTING CONTROL

Filed Nov. 7, 1951 2 SHEETS—SHEET 1

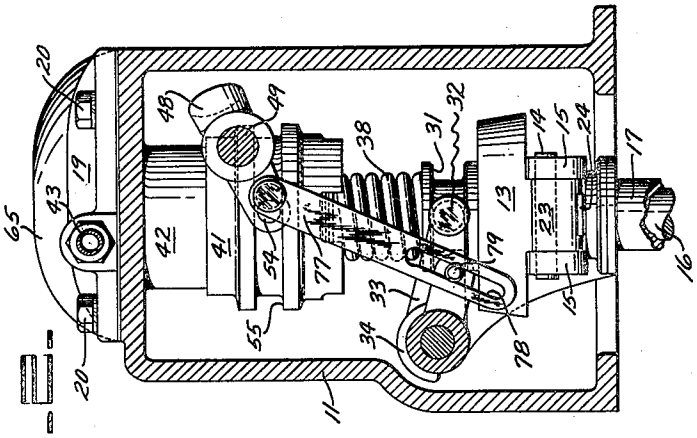


FIG. 2

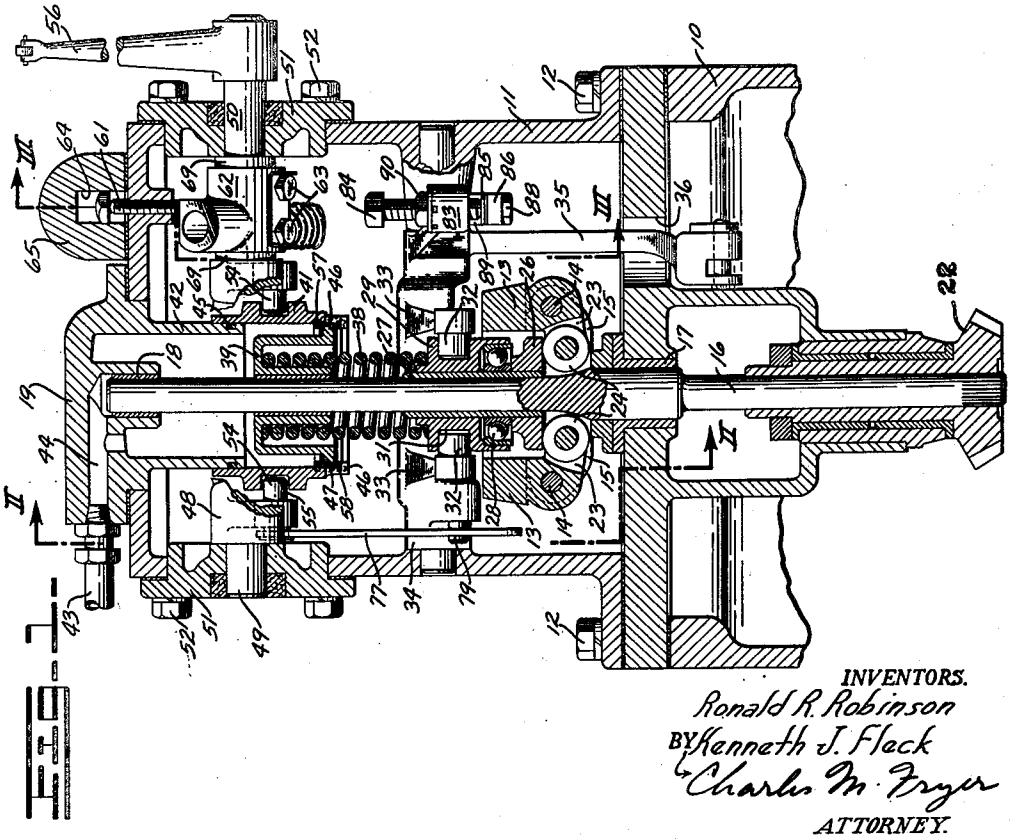


FIG. 1

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Fig. 4.

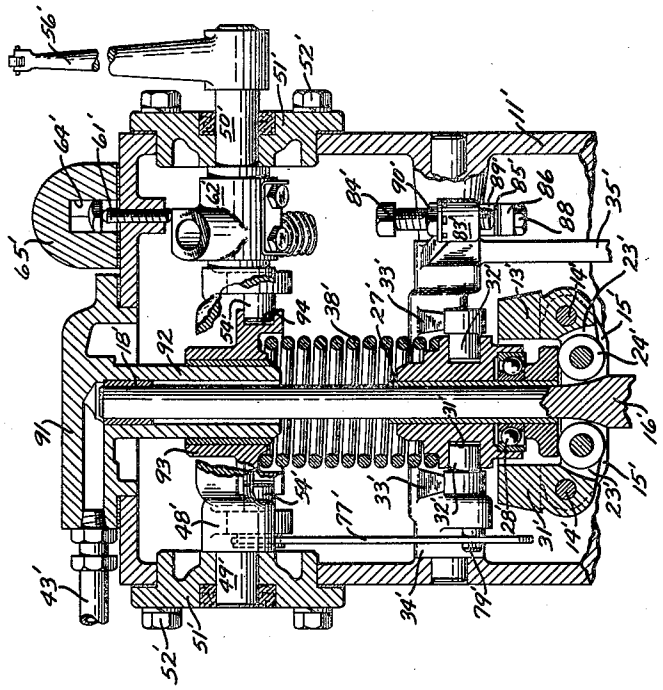
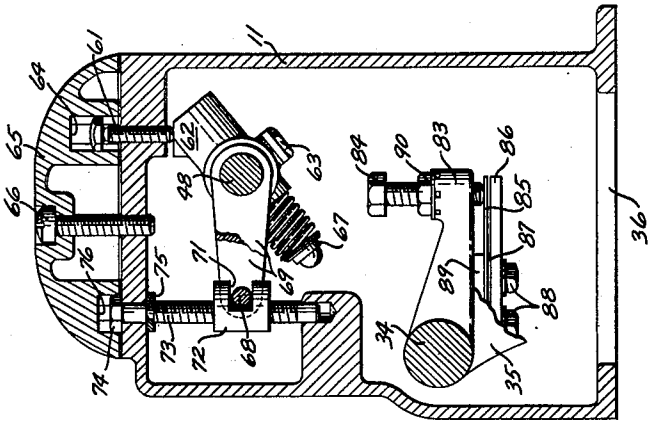


Fig. 3.



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CENTRIFUGAL TYPE ENGINE GOVERNOR HAVING HYDRAULICALLY ASSISTED SPEED SETTING CONTROL

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4 Claims. (Cl. 264—3)

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The present invention relates to engine governors in general and more particularly to a centrifugal type governor with a hydraulic booster between the control member and governor spring for reacting the force of the governor spring and which may be readily converted from a hydraulically boosted governor to a mechanically operated governor with a minimum of changes in the parts.

In most engines of the compression ignition type a spring-balanced centrifugal governor is provided for controlling the quantity of fuel metered to the engine in response to engine load. In governors of this type the governed speed of the engine is established by the load imposed on the governor spring through either manual or pedal actuated linkage associated with the governor spring. Manually actuated linkages usually include a locking device such as a ratchet for reacting the force of the governor and are commonly employed on stationary engines, tractors, and like installations in which it is not necessary to make frequent changes in the governed speed of the engine. However, in automotive type vehicles in which frequent changes in the governed speed of the engine are encountered it is desirable to employ pedal actuated linkage for loading the governor spring. In the past, one of the principal difficulties encountered in this type of governor is that the pedal is subject to variable forces exerted by the governor fly weights under varying operating conditions, and it is impractical for an operator to maintain any established governor setting by the pressure of his foot on the pedal.

It is an object of the present invention to provide a spring-balanced centrifugal governor for an internal combustion engine having hydraulic means for loading the governor spring wherein the forces of the governor spring and flyweights will react against the hydraulic means instead of the control linkage. It is another object of this invention to provide a spring-balanced centrifugal governor for an internal combustion engine having a hydraulic booster for loading the governor spring in which stops are provided limiting relative movement of the hydraulic booster parts to permit mechanical operation of the governor in the absence of hydraulic pressure. Another object of this invention is the provision of a spring-balanced centrifugal governor for an internal combustion engine having a mechanical connection between the governor spring loading control and the engine fuel metering control to provide a positive connection between the two when the governor is moved to its shut-down

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position. Still another object of this invention is the provision of a spring-balanced governor for an internal combustion engine which may be readily converted to either mechanically actuated or hydraulically actuated with a minimum of changes to the governor parts.

Other objects and advantages of this invention will be made apparent in the following specification wherein reference is made to the accompanying drawings.

In the drawings:

Fig. 1 is a vertical sectional view through a hydraulically boosted engine governor embodying the present invention;

Fig. 2 is a sectional view taken along the line II—II of Fig. 1;

Fig. 3 is a sectional view taken along the line III—III of Fig. 1; and

Fig. 4 is a view like Fig. 1 of a modified form of this invention.

In Fig. 1 of the drawings, the invention is illustrated in its association with a fuel pump housing part of which is shown at 10. The housing contains a plurality of fuel pumps (not shown) one for each cylinder of the engine, of a well-known type in which angular adjustment of the pump plungers determines the quantity of fuel delivered to the respective cylinders upon each stroke of the plunger. Angular adjustment of the fuel pump plungers is accomplished by a rack bar meshing with a gear on each plunger and is controlled by the position of the flyweights forming a part of the governor.

The governor is illustrated as comprising a housing 11 secured as by cap screws 12 to the fuel pump housing 10 and enclosing a pair of centrifugally actuated flyweights 13 supported for rocking movement about pins 14 carried in outwardly extending ears 15 formed on a shaft 16. The shaft 16 is journalled for rotation in spaced bearings 17 and 18 carried in the fuel pump housing 10 and a cover 19 secured to the governor housing by cap screws 20 (Fig. 2) respectively. The end of shaft 16 extending into the fuel pump housing carries a gear 22 adapted to mesh with other gearing (not shown) to drive the shaft in timed relation to the engine crankshaft.

The flyweights are provided with inwardly extending fingers 23 which support rollers 24 adapted to engage a thrust washer 26 passed on to the end of a sleeve 27 slidably and rotatably mounted on the shaft 16. Washer 26 is adapted to engage the inner race of a thrust bearing 28, the outer race of which is carried in a collar 29 carried for sliding movement on sleeve 27. The

periphery of sliding collar 29 is provided with groove 31 for the reception of pins 32 carried in arms 33 extending from and forming a part of a yoke 34, the ends of which are journalled for rocking movement in the housing 11. The yoke 34 is provided with a lever 35 extending through a slotted opening 36 in the fuel pump housing 10 and its extending end is adapted to be connected to the fuel pump rack bar (not shown) to effect adjustment of the quantity of fuel metered to the engine in response to movement of the fly weights.

Outward swinging of the flyweights 13 by centrifugal action moving the yoke 34 in a direction to decrease the quantity of fuel metered to the engine is opposed by a governor spring 38 interposed between sliding collar 29 and a piston 39 carried for limited sliding movement in a sleeve 41. The sleeve 41 embraces a hollow cylindrical projecting part 42 of cover 19 and is adapted for axial sliding movement thereon forming an extensible cylinder adapted to receive fluid under pressure from the engine lubricating oil pump (not shown) through a pipe 43 and a passage 44 in cover 19. An oil seal 45 is provided between sleeve 41 and the exterior of cylindrical part 42 so that the oil entering the cylinder is discharged into the governor housing through notches 46 provided in the periphery of the open end of sleeve 41. The piston is provided with an outwardly extending flange 47 which cooperates with the notches 46 to control the rate of fluid discharge from the interior of the cylinder. By controlling the rate of fluid discharged from the cylinder the pressure acting on the piston 39 may be varied to increase or decrease the load on the governor spring 38 it being understood that a constant flow of oil under pressure from the pipe 43 passes through the cylinder and escapes through the notches 46.

Movement of sleeve 41 to vary the fluid pressure acting on piston 39 is accomplished through a forked control lever 48 having ends 49 and 50 of reduced diameter supported for rocking movement in covers 51 secured as by cap screws 52 to the sides of the governor housing 11. The extending parts of the lever 48 carry pins 54 which are received in a groove 55 provided on the exterior of sleeve 41. The end 50 of control lever 48 extends through cover 51 and carries a lever 56 forming a part of the pedal actuated control linkage (not shown). Provision is made for actuating the piston mechanically in the absence of hydraulic pressure or in the event that it is desirable to move the control more rapidly than can be accomplished by fluid pressure by means of a pair of snap rings 57 and 58 carried in grooves formed in the interior of sleeve 41. One of the snap rings is disposed on each side of the flange 47 on the piston and they are adapted to engage opposite sides of the flange actuating the piston upon movement of the sleeve 41. The snap rings are spaced from each other to allow sufficient relative movement between the piston and sleeve to control the oil flow through the notches 46 under normal conditions of operation.

The maximum governor spring load and therefore the maximum governed speed of the engine is limited by an adjustable screw 61 threaded through the housing 11 and adapted to engage a stop member 62 secured as by cap screws 63 to control lever 48. The high idle adjusting screw is retained in its position of adjustment by the reception of its head in a recess 64 provided in a cover 65 secured as by a cap screw 66 (Fig. 3) to the governor housing. The low speed or idle position of the control lever is established by engagement of a spring-loaded plunger 67 carried in stop member 62 with a pin 68 carried in a pair of spaced links 69 pivotally supported from the control lever 48. The pin 68 is also carried in a recess 71 formed in a block 72 having a threaded engagement with a low speed adjusting screw 73 extending through and adapted for rotation in suitable openings in the housing 11. The low speed adjusting screw is held against axial movement by a head 74 and a snap ring 75 carried in a groove in the screw. The low speed adjusting screw is held against rotation by the reception of its head in a recess 76 provided in the cover 65. Engagement of the spring-loaded plunger 67 with pin 68 establishes the position of the control lever at the lowest idling speed of the engine. However, when it is desired to shut the engine down the control lever 48 may be rocked upwardly as viewed in Fig. 3 to shut off the supply of fuel to the engine depressing the plunger 67 to permit it to pass over the pin 68. After the plunger 67 passes beyond the pin 68 it will again be extended by the spring and prevent the accidental return of the governor control to an operating position.

Movement of the control lever 48 to the shut-off position also actuates yoke 34 moving the fuel pump rack bar to its fuel shut-off position. This is accomplished by a link 77 connecting control lever 48 to yoke 34. The link 77 is provided with an elongated slot 78 illustrated in Fig. 2 for the reception of a pin 79 extending from one of the arms 33 of yoke 34 so that during normal operation of the governor the yoke is free to move in response to the unbalance of forces between the flyweights and governor spring to vary the quantity of fuel metered to the engine in response to engine load. However, when the control lever 48 is moved to the shut-off position the end of slot 78 engages pin 79 rocking yoke 34 in a direction to shut off the supply of fuel to the engine.

The governor also includes means for controlling the torque characteristics of the engine comprising an arm 83 formed on the yoke 34 which at its extending end carries a set screw 84 adapted to engage a spring 85. The spring 85 is spaced from a solid stop 86 by a spacing block 87 and all three are secured as by cap screws 88 to a boss 89 forming a part of the governor housing 11. Engagement of the set screw 84 with the spring 85 establishes the position of the yoke 34 and fuel pump rack bar at full load rated speed of the engine. Upon decreasing speed of the engine due to overload, the spring 85 yields to the force of the governor spring permitting further movement of the yoke 34 in the direction to increase the quantity of fuel metered to the engine until the spring 85 engages the solid stop 86 to produce a corresponding increase in engine torque. The position of the yoke 34 controlling the quantity of fuel metered to the engine at full load may be adjusted by manipulation of set screw 84 which is retained in its position of adjustment by a lock nut 90.

In Fig. 4, a modified form of this invention is illustrated in which like parts are identified with the same reference characters primed. The principal difference in this modification is that the hydraulic booster for loading the governor spring is replaced by a direct mechanical connection with the control lever 48'. In this modifi-

cation the cover 19 illustrated in Figs. 1 and 2 is replaced by a cover 91 having a cylindrical projecting part 92 which is embraced by sliding collar 93 adapted for axial sliding movement thereon. The sliding collar 93 serves as a retainer for one end of the governor spring 38' and is provided with a groove 94 in its periphery for the reception of pins 54' carried in the extending arms of control lever 48'. With the construction shown in this modification, adjustment of the speed of the engine is accomplished in exactly the same manner except that the force or load on the governor spring must be reacted by a suitable friction or throttle locking device (not shown). This modification is particularly adapted for use on stationary engines, tractors, or the like which are not subject to frequent variations in the governed speed of the engine.

We claim:

1. In a spring balanced centrifugal type engine governor control means comprising an open ended cylinder adapted to receive fluid under pressure, a sleeve surrounding and slidable over the open end of the cylinder to vary its effective length, a seat for the governor spring carried for sliding movement within the sleeve, said sleeve having exhaust openings adapted to be uncovered by relative movement between the spring seat and sleeve to vary the pressure exerted on the governor spring by the fluid in the cylinder.

2. In a spring balanced centrifugal type engine governor control means comprising an open ended cylinder adapted to receive fluid under pressure, a sleeve surrounding and slidable over the open end of the cylinder to vary its effective length, a seat for the governor spring carried for sliding movement within the sleeve, said sleeve having exhaust openings adapted to be uncovered by relative movement between the spring seat and sleeve to vary the pressure exerted on the governor spring by the fluid in the cylinder, and stop means on the sleeve adapted to engage the spring seat limiting relative movement between the sleeve and spring seat, said stop means being effective to actuate the spring seat in the absence of fluid pressure in the cylinder.

3. In a spring balanced centrifugal type engine governor having centrifugally actuated flyweights for positioning a fuel control member, a governor spring opposing the action of the flyweights, and control means comprising an open ended cylinder adapted to receive fluid under pressure, a sleeve surrounding and slidable over the open end of the cylinder to vary its effective length, a seat for the governor spring carried for sliding movement within the sleeve, said sleeve having exhaust openings adapted to be uncovered by relative movement between the spring seat and sleeve to vary the pressure exerted on the governor spring by the fluid in the cylinder, means for positioning the sleeve on said cylinder, and a link connecting said means for positioning the sleeve with the fuel control member and having a slotted connection therewith to prevent interference with movement of the fuel control member except upon movement of the sleeve positioning means to the engine shut-off position.

4. In a spring balanced centrifugal type engine governor having centrifugally actuated flyweights for positioning a fuel control member, a governor spring opposing the action of the flyweights, and a movable seat for the governor spring, control means for varying the position of the seat to vary the load on the governor spring, link means connecting the control means with the fuel control member, a slidable connection between the fuel control member and the link to permit unrestrained movement of the fuel control member throughout its entire range except when the control means is moved to the engine shut-off position.

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