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CENTRIFUGAL TYPE GOVERNOR HAVING HYDRAULICALLY ASSISTED SPEED SETTING CONTROL

Original Filed Nov. 4, 1947

FIG. 1.

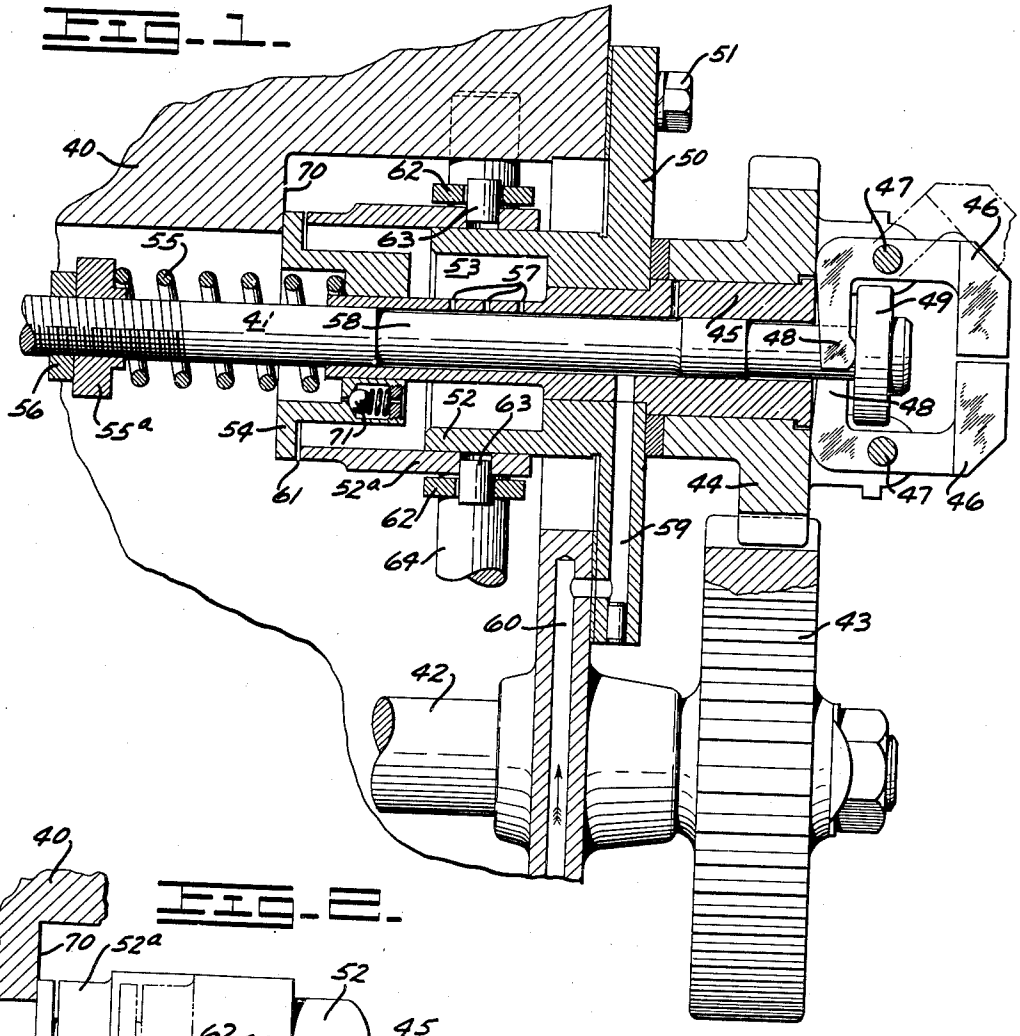
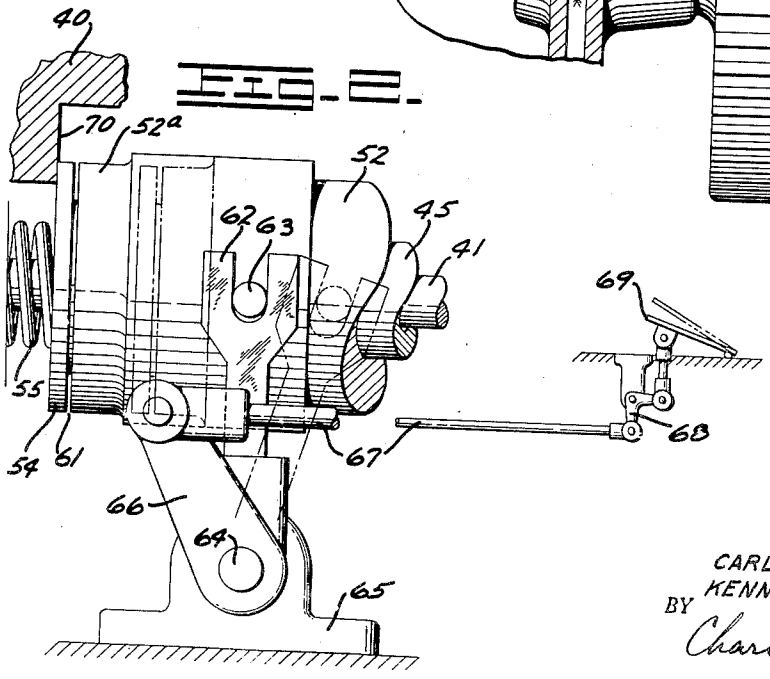


FIG. 2.



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CENTRIFUGAL TYPE GOVERNOR HAVING HYDRAULICALLY ASSISTED SPEED SETTING CONTROL

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2 Claims. (Cl. 264—3)

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The present invention relates to engine governors and particularly to a pedal controlled governor with a booster or hydraulic device interposed between the pedal and the governor spring. This application is a division of our copending application entitled "Engine Governor Control," filed November 4, 1947, Serial No. 783,958, now abandoned.

In most engines of the compression ignition type, a spring balanced centrifugal fuel feed governor is controlled or set by a hand lever mechanically held in any of its positions of adjustment. If such a governor is to be actuated by a foot pedal, as is desirable when an engine of this type is used in a truck or similar vehicle, the foot pedal is subject to variable forces exerted by the governor fly-weights under varying operating conditions. It is, therefore, impractical if not impossible for an operator to maintain any established governor setting by the pressure of his foot on the pedal. The present invention overcomes this difficulty by the use of hydraulic means interposed between the foot pedal and the governor so that the pedal controls the hydraulic means and through such means the governor setting, but the forces of the governor action react against the hydraulic means instead of against the foot pedal.

An object of the present invention, therefore, is to provide hydraulic means in association with a governor and foot pedal for controlling the setting of the governor wherein the forces of the governor operation will react against the hydraulic means instead of the foot pedal and wherein the foot pedal can be moved throughout the entire range of its governor setting operation without substantial variation in the force required to move the pedal. A further object of the invention is to provide an engine governor of the centrifugal type having fly-weights associated directly with a fuel control member to eliminate linkage ordinarily employed and thus make possible the use of relatively small fly-weights. Another object of the invention is to provide an engine governor with an actuating means in the form of a hydraulic cylinder capable of being operated by engine lubricating oil pressure and conveniently controlled by pedal actuated linkage. Still further and more specific objects and advantages of the invention are made apparent in the following description wherein reference is made to the accompanying drawing.

In the drawing:

Fig. 1 is a longitudinal sectional view taken

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through the principal portions of a governor and control mechanism embodying the present invention and showing a part of the fuel control means regulated thereby;

Fig. 2 is a fragmentary view in elevation of a portion of the mechanism illustrated in Fig. 1 and also showing diagrammatically a means for connecting a foot pedal with the engine governor control illustrated in Fig. 1.

In Fig. 1 of the drawing, the invention is illustrated in association with a fuel pump housing, a portion of which is shown at 40. This fuel pump housing contains a plurality of fuel pumps (not shown), one for each cylinder of the engine, and the pumps are driven in a conventional manner by cams on a cam shaft, one end of which is illustrated at 42. The fuel pumps are of the metering type wherein angular adjustment of the pump plungers determines the quantity of fuel delivered to the respective cylinders upon each plunger stroke, and a rack bar meshing with a gear on each of the plungers is employed to effect this angular adjustment. One end of the rack bar is shown at 41 in Fig. 1.

The cam shaft illustrated at 42 carries a gear 43 meshing with a gear 44 rotatably mounted on an elongated bushing 45 projecting through the side wall of the fuel pump housing. The gear 44 carries fly-weights 46 pivoted on pins 47 and having fingers 48 engageable with a thrust collar 49 on an extended end of the rack bar 41 which is slidably supported in the bushing 45. A plate 50 secured to the wall of the fuel pump housing 40 by cap screws 51 embraces the bushing 45 and has an integrally extending hollow cylindrical member 52. A cylindrical sleeve 52a is slidably mounted on the cylindrical member 52 and forms therewith a substantially cylindrical chamber 53, one end of which is open but adapted to be closed by movement toward a piston-like member 54 slidable on the inner extended end of the bushing 45. A governor spring 55 seats at one end against the piston 54, and at its other end against an adjustable nut 55a locked in position on the rack bar 41 as by a lock nut 56. Fluid under pressure, preferably lubricating oil from the engine, is constantly directed into the chamber 53 formed by the members 52 and 52a. The fluid enters this chamber through a plurality of ports 57 formed in the bushing 45. These ports are preferably arranged in line longitudinally of the bushing and communicate with the interior thereof at a reduced portion 58 in the rack bar 41. Also communicating with said reduced portion 58 is a duct 59

in plate **50** which communicates in turn with a similar duct **60** in the wall of the pump housing. This port may be connected by any suitable means (not shown) with the lubricating oil under pressure. The fluid directed to the chamber **53** in this manner is, under normal conditions, permitted to escape through an opening **61** between the piston **54** and the member **52***a* which forms a portion of the fluid chamber.

In order to vary the dimensions of the opening **61** through which the fluid escapes and thereby control the pressure exerted on the spring **55**, the member **52***a* is slidable on the member **52** and is controlled by a yoke or pair of bifurcated levers **62** which, as best shown in Fig. 2, engage pins **63** fixed in opposite sides of the member **52***a*. The levers **62** are fixed to a shaft **64** rotatably supported as in a bracket **65**. A lever **66** is also fixed to the shaft **64** and is connected as by linkage, shown at **67** in Fig. 2, with a bell crank **68** actuated by a foot pedal **69**.

The position of the parts illustrated in Figs. 1 and 2 is that which they would occupy under full load adjustment of the governor with the foot pedal depressed and the slidable cylinder part **52***a* extended to the left as far as possible to diminish the size of the opening **61** and cause the member **54** to come to rest against a shoulder **70** in the fuel pump housing establishing the maximum fuel feed position of the rack bar **41**. If the pressure on the foot pedal is released, it will move upwardly to the dotted line position illustrated in Fig. 2 and permit the member **52***a* to move to the right under influence of the governor spring **55** and the member **54**.

In operation, the governor fly-weights act against the normal tension of the governor spring **55**, and while the engine is operating, a constant flow of fluid such as lubricating oil under pressure, will be directed through the cylindrical sleeve **52***a* passing between its open end and the piston **54**. In order to increase the speed of the engine, the sleeve is moved to the left as viewed in Fig. 1 by the foot pedal **69**. This movement tends to close the opening **61** and increase the pressure acting on the piston **54**, thus increasing the load on the governor spring. With this arrangement, there is very little opposition to movement of the cylindrical sleeve, and it may be easily adjusted by light pressure of the foot on the control pedal, as it is the pressure within the cylindrical sleeve which reacts the force of the governor spring and fly-weights. In a like manner, the speed of the engine is decreased by movement of the sleeve to the right allowing fluid to escape from the cylindrical sleeve at a lower pressure. At this time, the piston **54** will be moved to the right decreasing the load on the governor spring, and when the speed of the engine is decreased sufficiently, the piston **54** closes the ports **57** one at a time thereby progressively reducing the amount of fluid delivered to the chamber **53** when fluid pressure requirements are reduced. Consequently with this arrangement, an excessive quantity of fluid is not withdrawn from the engine lubricating system so that there is no danger of the system failing to meet its usual demands of engine lubrication.

This governor also has the advantage that it can be adjusted mechanically in the absence of fluid pressure by direct contact of cylindrical sleeve **52***a* with piston **54**, thus permitting more rapid speed adjustments than can be met by fluid pressure in the chamber **53**. A check valve illustrated at **71** is provided in the piston **54** to admit air to the chamber **53** in the event that the speed of adjustment is greater than can be met by fluid pressure in chamber **53** and is accomplished mechanically. In addition, the construction shown herein allows the governor fly-weights to act directly on the fuel pump control rack **41**, and, therefore, may be made considerably smaller than usual, in that their action is not called upon to overcome the friction and inertia of the usual linkage with which fly-weights are ordinarily connected with the part to be controlled.

We claim:

1. In a spring balanced centrifugal type governor, a hydraulically actuated piston serving as a retainer for one end of a governor spring, a cylinder receiving fluid under pressure to effect movement of the piston, a foot actuated member for controlling the pressure of the fluid in the cylinder, a passageway including a plurality of orifices for admitting said fluid under pressure to the cylinder, and means on said piston to close said orifices one at a time as the piston is moved in a direction to reduce the load on the governor spring whereby the flow of fluid to the cylinder is progressively retarded as the governor is adjusted toward its low speed operating position.

2. In a spring balanced centrifugal type governor, a piston-like member serving as a retainer for one end of a governor spring, a cylinder adapted to receive fluid under pressure and having an open end moveable with respect to said member whereby such movement will control escape of fluid from the cylinder and thus vary the pressure exerted on said member to adjust the tension of the governor spring, a passageway including a plurality of orifices for admitting said fluid under pressure to the cylinder, and means on said piston to close said orifices one at a time as the piston is moved in a direction to reduce the load on the governor spring whereby the flow of fluid to the cylinder is progressively retarded as the governor is adjusted toward its low speed operating position.

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