Feb. 16, 1954 E. M. BIMBERG 2,669,229

GOVERNOR

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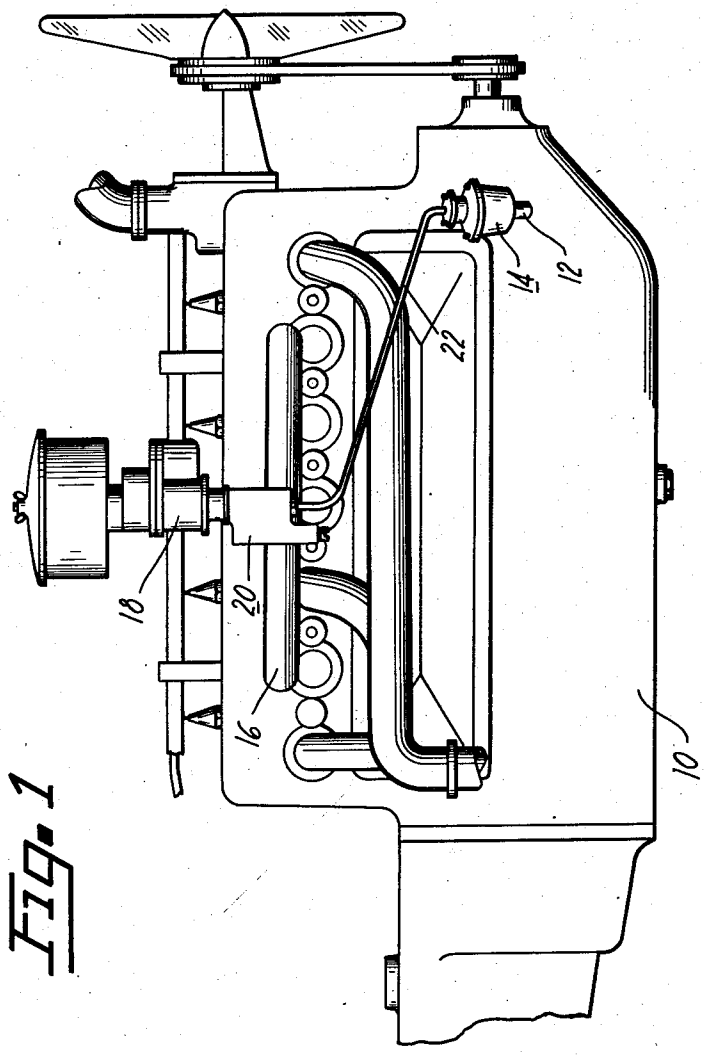


Fig. 1

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Filed Dec. 21, 1948 2 Sheets-Sheet 2

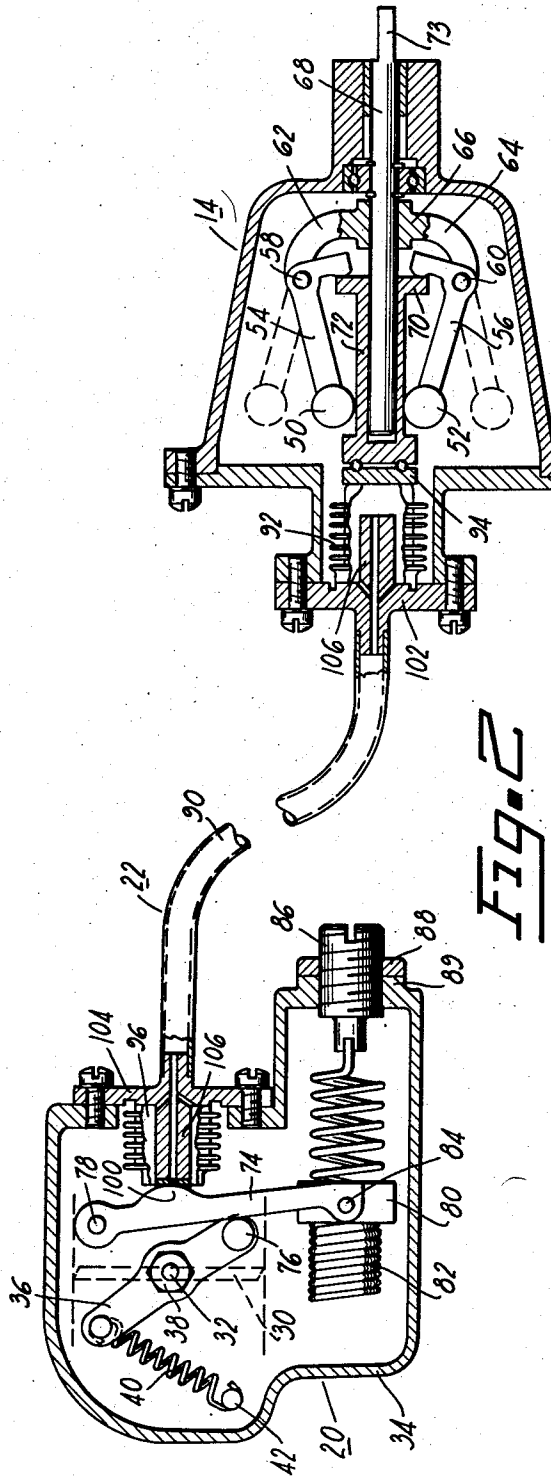


Fig. 2

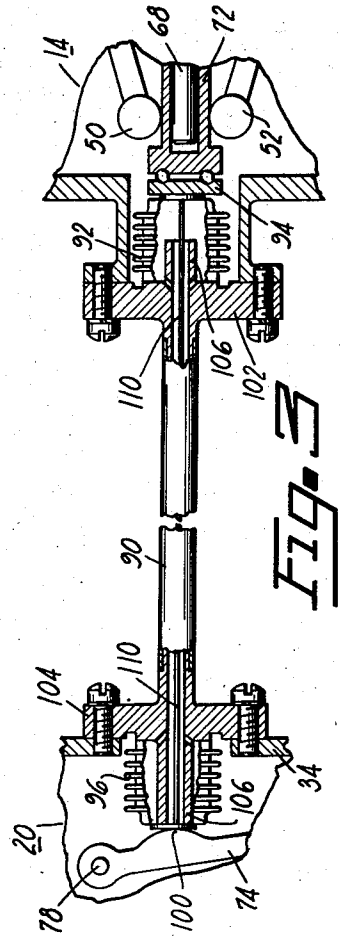


Fig. 3

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GOVERNOR

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5 Claims. (Cl. 123—108)

1

The present invention relates to governors for internal combustion engines, especially for automotive vehicles, and more particularly to governors of the centrifugal weight type for regulating the speed of the engine by controlling the flow of air or fuel-air mixture to the engine.

On standard engines, the power take-off adapted for installation of a centrifugal governor and the air valve controlled by the governor are often so arranged in relation to one another that a direct drive or linkage for the governor cannot be used. This has often made the use of a centrifugal type governor impractical. It is, therefore, one of the principal objects of the present invention to provide a centrifugal governor which is readily adaptable for use on any internal combustion engine irrespective of the relative positions of the power take-off for the governor and the air control valve in the induction passage of the engine.

Another object of the invention is to provide a means for controlling the speed of an internal combustion engine, which can easily be installed on any internal combustion engine and thereafter readily adjusted to give the desired maximum engine speed.

A further object of the invention is to provide an accurate and dependable motion transmitting means between two parts of a governor or the like, such as the centrifugal weight assembly and the main governor spring and air valve assembly.

Additional objects and advantages of my invention will appear from the following description and accompanying drawings, wherein two arrangements of the invention are disclosed. The invention hereinafter described is not limited to the particular embodiments disclosed, but is understood to be available in any case wherein the centrifugal weight type mechanism is employed to control another element or mechanism, such as a valve for controlling the flow of air or fuel-air mixture to the engine or a fuel valve for controlling the flow of fuel in a fuel supply system for an engine or the like.

In the drawings:

Figure 1 is a side elevation of an internal combustion engine on which the present governor is mounted;

Figure 2 is a cross-sectional view of my governor showing the several elements thereof in operative relationship; and

Figure 3 is a fragmentary cross-sectional view of the governor showing a modified form of the connecting means between two governor elements.

2

Referring more specifically to the drawings, and to Figure 1 in particular, in which a side elevation of a conventional internal combustion engine is shown, numeral 10 designates a crank case, 12 a power take-off from the cam shaft (not shown), 14 an element of my governor including the centrifugal weight assembly, 16 an intake manifold, 18 a conventional carburetor, and 20 another element of the governor including the main governor spring, mounted on said carburetor at the throttle valve or on a governor air valve body and connected to the governor element 14 by a power transmitting member 22.

In Figure 2 of the drawings, an air valve 30, which in the present example is the throttle valve of the carburetor, is shown mounted in the induction passage on a shaft 32, one end of which extends into housing 34 of the governor element 20. In some installations the air valve may be mounted in a separate governor body and operated independently of the throttle valve. A lever 36 is mounted on the end of throttle valve shaft 32 and is held in fixed position in relation to said shaft by a nut 38 threaded onto the end of the shaft. Throttle valve 30 is constantly urged toward wide open position and caused to follow a one-way manually actuated throttle control means (not shown), such as that disclosed in application Serial No. 737,148, now Patent No. 2,613,657, filed March 25, 1947, by a coiled torque spring 40 connected at one end to lever 36 and at the other end to a fixed anchor pin 42 seated in a side wall of housing 34. Sufficient torque must be provided, in addition to that required to overcome the effect of air flow in the induction passage tending to close the throttle valve, to move the throttle valve in the opening direction when the operator actuates the accelerator lever during the time the centrifugal mechanism of the governor is in its ineffective position.

The centrifugal mechanism 14 of the governor includes weights 50 and 52 mounted on the long arms of bell cranks 54 and 56, respectively, which are pivoted on pins 58 and 60 extending through the tines of bifurcated brackets 62 and 64, said brackets being integrally and rigidly joined to a sleeve member 66 adapted to rotate in unison with shaft 68. The short arms of levers 54 and 56 bear against a flange 70 on one end of a sleeve 72 which is adapted to rotate in unison with shaft 68 and to move axially thereon as weights 50 and 52 move outwardly and inwardly with changes of engine speed. A flattened portion 73 is provided on the end of shaft 68 for connecting said shaft to the power take-off 12 of the engine.

The longitudinal movement of sleeve 72 is transmitted to lever 36 and to the throttle valve 30 through connecting member 22, a lever 74 and a roller 76 mounted on one end of lever 36. Lever 74 is pivoted at one end on a fixed pin 78 and pivotally supports at the other end a nut 80 threaded to receive the convolutions of a main governor spring 82. The spring, acting through lever 74 and connecting member 22, is adapted to oppose the outward movement of fly-balls 50 and 52 as they are rotated about shaft 68 in accordance with engine speed.

An adjustment means is provided to vary the rate and tension of spring 82 to obtain any desired maximum engine speed. The main governor spring 82, which is threaded into the nut 80 pivotally secured by pins 84 to a pair of arms on the free end of lever 74, is anchored at one end to a screw 86 threadedly received in a nut 88 seated on a boss 89 of the governor housing. The spring convolutions to the left of nut 80 are ineffective and perform no function in the governing operation. In this arrangement when an adjustment is to be made, the spring rate is changed by rotating screw 86, nut 88 and spring 82 in unison, the spring thus turning in nut 80 to increase or decrease the number of effective convolutions between said nut and screw 86, while the spring tension is adjusted by turning nut 88 relative to screw 86. A suitable locking means, such as interlocking serrations on nut 88 and boss 89 (not shown), is provided to hold screw 86 and nut 88 in their adjusted position.

The connecting member 22 consists of a tube 90, such as copper tubing, connected at one end to a bellows 92, abutting against a bearing 94 on sleeve 72, and connected at the other end to a bellows 96 abutting against a boss 100 on lever 74, said bellows 92 and 96 being secured to stationary plates 102 and 104 of assemblies 14 and 20, respectively. The tube and two bellows are completely filled with a hydraulic fluid and then hermetically sealed. A stem 106 may be provided in each bellows to limit the longitudinal movement thereof and to permit the use of a relatively large bellows while keeping the volume of fluid in the system relatively small. It is thus seen that any movement of sleeve 72 to the left in response to the outward movement of fly balls 50 and 52 compresses bellows 92, forcing a portion of the fluid contained therein through tube 90 into bellows 96 and thereby expanding said latter bellows and urging lever 74 in the direction to close throttle valve 30. As the engine speed decreases and spring 82 contracts, lever 74 moves to the right, compressing bellows 96 and causing a portion of the fluid contained therein to flow through tube 90 into bellows 92. It is thus seen that the centrifugal weight assembly of the governor can conveniently be mounted on any suitable power take-off drive of the engine and the governor spring and throttle control assembly can be mounted on the carburetor or governor air valve body and the two assemblies connected for operation by member 22 regardless of the location of the power take-off to the throttle valve.

In the embodiment shown in Figure 3, in which like numerals are used to designate like parts, a wire 110 or the like having a very low thermal expansion, is securely anchored to the end of bellows 92 adjacent bearing 94 and extends through tube 90 to bellows 96 and is anchored to the end thereof adjacent lever 74. This wire minimizes the effect of fluid expansion resulting from temperature changes on the operation of the governor. The operation of the modification shown in Figure 3 is otherwise the same as that shown in Figure 2. Further modifications in the present invention are possible, as will occur to those skilled in the art, for example, various relationships in the size of the two bellows may be used to obtain predetermined governing characteristics. While only two embodiments of my invention are shown herein, various other changes and arrangements of my governor may be made to suit requirements.

I claim:

1. A governor for an engine having an air valve, comprising a yieldable means for urging the air valve in the opening direction, a shaft adapted to be rotated in accordance with engine speed, a plurality of centrifugal weights, levers pivoted on said shaft for supporting said weights, a member adapted to be moved by said levers, a lever pivoted at one end and spring loaded at the other end for yieldably opposing the movement of said member by said levers, and means including a fluid chamber having a movable wall operatively connected to said member, a second fluid chamber having a movable wall operatively connected to said last mentioned lever, and a conduit connecting said chambers, whereby the motion of said member is transmitted to said last mentioned lever.

2. A governor for an engine having an air valve, comprising a yieldable means for urging the air valve in the opening direction, a shaft adapted to be rotated in accordance with engine speed, a plurality of centrifugal weights, levers pivoted on said shaft for supporting said weights, a member adapted to be moved by said levers, a lever pivoted at one end and spring loaded at the other for yieldably opposing the movement of said member by said levers, means including a fluid chamber having a movable wall operatively connected to said member, a second fluid chamber having a movable wall operatively connected to said last mentioned lever, a conduit connecting said chambers, and a means movable by the last mentioned lever for urging the air valve in the closing direction.

3. A governor for an engine having an induction passage with an air valve therein, comprising a yieldable means for overbalancing the air flow urging said valve towards closed position, a shaft adapted to be rotated in accordance with engine speed, a plurality of centrifugal weights driven by said shaft, levers pivoted on said shaft for supporting said weights, a member mounted on said shaft adapted to be moved by said levers, a lever pivoted at one end and spring loaded at the other for yieldably opposing the movement of said levers, and means including a bellows having one end operatively connected to said member, a second bellows having one end operatively connected to said last mentioned lever, a conduit connecting said bellows, and a means movable by the last mentioned lever for urging the air valve in the closing direction.

4. A governor for an engine having an induction passage with an air valve therein, comprising a yieldable means for overbalancing the air flow urging said valve towards closed position, a shaft adapted to be rotated in accordance with engine speed, a plurality of centrifugal weights driven by said shaft, levers pivoted on said shaft for supporting said weights, a member mounted on said shaft adapted to be moved by said levers,

a lever pivoted at one end and spring loaded at the other for yieldably opposing the movement of said levers, means including a bellows having one end operatively connected to said member, a second bellows having one end operatively connected to said last mentioned lever, a conduit connecting said bellows, a fluid filling said bellows and conduit, a member of low thermal expansion in said conduit operatively connecting said bellows, and a means movable by the last mentioned lever for urging the air valve in the closing direction.

5. A governor for an engine comprising a centrifugal weight assembly adapted to be driven by said engine, a governor spring assembly remotely spaced from said centrifugal weight assembly and adapted to operate a control means of said engine, and a means connecting said assemblies including a liquid-filled chamber having a fluid pressure responsive wall operatively connected to said centrifugal weight assembly, a second liquid-filled chamber having a fluid pressure responsive wall operatively connected to said spring assembly, and a liquid-filled conduit continuously connecting said chambers.

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