

March 30, 1948.

F. A. ZIMMERMAN

2,438,734

GOVERNOR

Filed April 6 1946

Fig. 1.

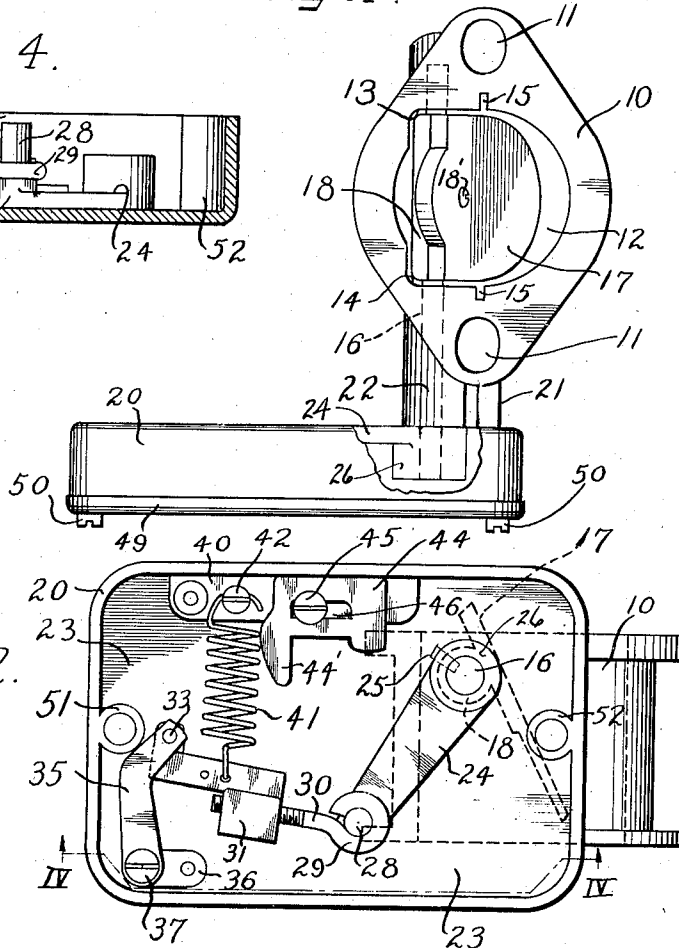


Fig. 2.

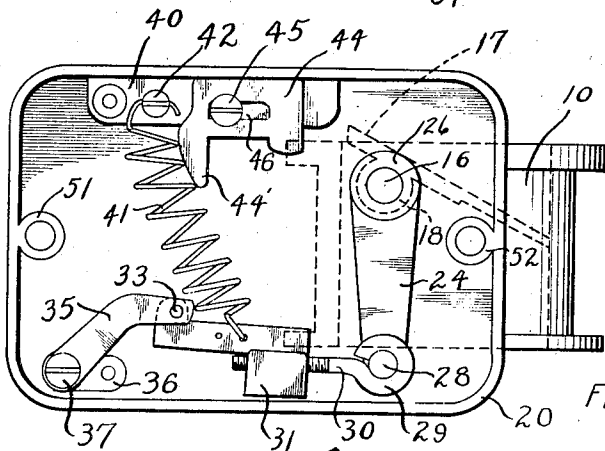
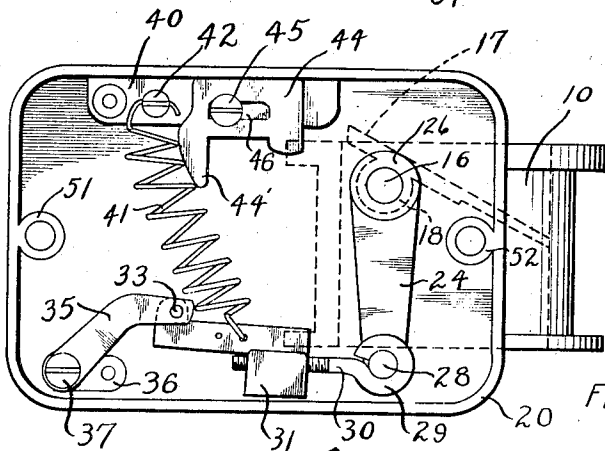


Fig. 3.



Inventor

FRANK A. ZIMMERMAN.

by The Firm of Charles Mills Attys

UNITED STATES PATENT OFFICE

2,438,734

GOVERNOR

Frank A. Zimmerman, Oak Park, Ill.

Application April 6, 1946, Serial No. 660,177

4 Claims. (Cl. 137—153)

1

This invention relates to governors and more particularly to an improved governor of the type shown in Patent No. 1,889,706, granted November 29, 1932.

Specifically this invention deals with an improved governor adapted for regulating the speed of an internal combustion engine.

In an internal combustion engine, which burns a gaseous or vaporous fuel mixture in the combustion chamber, the speed is usually regulated by controlling the quantity of such mixture that is delivered to the combustion chamber. Consequently the maximum speed of the engine can be effectively limited by restricting the passage through which the fuel passes.

A conventional way of putting into practice this method of limiting the maximum speed of an engine is by use of a governor comprising a valve pivotally mounted in a housing. This housing is adapted to be positioned in the fuel delivery line between the carburetor and the intake manifold of an engine. The valve is responsive to the suction created in the intake manifold and is so arranged that it tends to close and restrict the passage as the suction increases with increasing engine speeds. An adjustable mechanical linkage means is provided to yieldingly resist the response of the valve to the suction of the engine until the engine reaches the desired maximum speed. At this speed the valve will so restrict the passageway that only that quantity of fuel required to maintain this maximum speed will be permitted to pass through.

In my invention I have provided a novel and improved means of varying the resistance of the mechanical linkage to the action of the valve. This improved regulating means permits the operator to select a maximum engine operating speed from a wide range of speeds. Moreover it provides a simple, readily accessible means of adjustment which is extremely accurate in maintaining the maximum speed setting.

For engine operation in the lower range of speeds it is desirable that the fuel passage be as free as possible of restrictions in order that the inrush of fuel to the combustion chamber be unimpeded for rapid acceleration to take up additional loads. In my invention I have incorporated in the linkage improved means for adjusting the valve to that position which will permit the maximum passage of fuel at low speeds and still present a sufficient area to the suction pressure to effect the initial movement of the valve as speed is increased.

An object of my invention is to provide a gov-

2

ernor structure of the type which may readily be inserted between the carburetor and the intake manifold of an internal combustion engine and which has improved adjusting means for varying the setting of the governor.

A further object is to provide a governor with a minimum of moving parts which is easy to install and adjust and which is accurate and dependable in operation.

A still further object of my invention is to provide a governor which will not in any way limit the power produced by the engine at any speed.

Another and further object of my invention is to provide a governor containing means for adjusting the angularity of the restricting valve at normal low engine speeds.

In accordance with the features of my invention there is provided a governor comprising a member, responsive to the suction in the intake manifold of an engine, together with improved adjustable means for yieldingly resisting the response of said member to the suction and which can be preset as desired.

An important feature of my invention resides in the provision of an adjustable block adapted to act on the yielding member of the linkage to vary its loading.

A further feature is the provision of an adjustable link to regulate the angularity of the valve in its housing.

A still further feature of my invention resides in the provision of a novel spring-loaded linkage mechanism to progressively resist the effect of the engine suction on the valve.

Other objects and features of this invention will more fully appear from the following detailed description taken in connection with the following drawings in which:

Figure 1 is a plan view of a governor embodying the features of my invention, showing it applied to an intake manifold;

Figure 2 is a front view of the governor with the cover plate removed, showing in dotted lines the manifold valve in its open position for normal low speed operation;

Figure 3 is a front view similar to Figure 2 but showing the valve, in dotted lines, and the linkage in a restricting position; and

Figure 4 is a sectional view taken substantially on line IV—IV of Figure 2, looking in a direction indicated by the arrows.

As shown on the drawings:

The governor of this invention comprises an oblong block 10 which is shaped to fit between

3

the carburetor and the intake manifold of an engine. Openings 11, adapted to register with the holes in the usual flange connections of the carburetor outlet and the manifold inlet, are provided through the block 10 so that the governor may be readily bolted in place.

The block 10 has a vertical passage 12 there-through for registering with the carburetor outlet passage and the manifold inlet passage. As best seen in Figure 1, the passage 12 in cross-section is substantially a circle to which has been added two corner pieces 13 and 14 and two rectangular slots 15. A shaft 16 extends across the passage 12 and is journaled at either end in the block 10.

Suspended in the passage 12 for pivotal movement about the shaft 16 is the suction responsive valve 17. As shown in Figure 2 in dotted line, a built-up hub section 18 acts as the bearing means on which the valve swings. A setscrew 18' secures the valve 17 to the shaft 16 to prevent lateral movement of the valve. The valve 17 is substantially of the same shape as the passage 12, with this exception. The axis of the valve 17 at right angles to its pivotal axis is greater than the corresponding axis of the passage. Therefore, as illustrated in Figure 3, the valve will never completely close and cut off the fuel supply to the engine, since, even when the valve has reached its maximum closed position, there will still be openings at the rear of the valve and around the sides. Also the auxiliary passages 15 are never effected by the operation of the valve and they in themselves will permit the passage of a limited quantity of fuel.

Referring to Figure 1, a housing 20 is disposed at right angles to the long axis of the oblong block 10 and is connected thereto by means of a strap 21 and a bar 22. The shaft 16, being journaled in the block 10 adjacent bar 22, extends through the bar into the housing 20.

The adjustable control linkage which, acting through shaft 16, resists the action of the manifold suction on valve 17 is mounted in housing 20. In Figure 2 the linkage is shown in a position in which the engine is operating at normal speeds. A lever 24, having a cylindrical boss 26 at one end, is secured, by means of a setscrew 25 through the boss 26, to the shaft 16 for pivoting movement therewith. At the other end the lever 24 comprises two cylindrical bosses 27 and 28, one on top of the other. The boss 28, being of smaller diameter, is on top of boss 27 (Figure 4).

Disposed around boss 28 and resting on the top surface of boss 27, is an eyelet 29 of an adjustable screw 30 of link 31. A pair of links 35 (Figure 4) is pivotally connected to link 31 by means of pin 33. The links 35 are fastened to a housing boss 36 by capscrow 37 for pivotal movement about said capscrow.

A rectangular boss 40 is provided at the top of the back wall 23 of the housing 20. One end of a coiled spring 41 is anchored around a capscrow 42 in the boss 40, while the other end of the spring engages in a hole in the link 31. Also mounted on boss 40 for sliding movement in a lateral direction is a spring-tension adjusting block 44. A capscrow 45 extends through slot 46 of adjusting block 44 for holding block 44 in place against boss 40. The block 44 has a lug or shoe 44' for pressing against spring 41 to adjust its effectiveness as shall appear hereinafter. When the capscrow 45 is loosened the block 44 may be moved to the right or to the left against spring 41.

A cover plate 43, secured in place on the bosses

4

51 and 52 of housing 20 by capscrows 50, is provided to protect the linkage mechanism from damaging contacts and excessive dirt. The boss 51 also is adapted to act as an abutment for limiting the swing of links 35 pivoting in a counter-clockwise direction around capscrow 37 as shown in Figure 2.

In practice the governor of my invention operates as follows. In its normal position, as for instance when the engine is idling, the valve 17 inclines away from the intake manifold, as shown in Figure 2. It is held in this position by the contracting action of spring 41 which, acting on link 31, causes links 35 to be rotated counter-clockwise about capscrow 37 until the links 35 bear against boss 51 of the housing 20. As link 31 moves link 35 into abutment with boss 51, it also moves adjusting screw 30 to the left, thus causing lever 24 to rotate the shaft 16 in a clockwise direction. Since the valve 17 is rigidly fastened to shaft 16, it is also rotated clockwise and takes up a position in the passage 12 as dictated by the amount the adjusting screw 30 is advanced in link 31. The adjusting screw 30 is a feature of my invention by means of which the suction responsive valve 17 may be adjusted to that position which permits the maximum unrestricted flow of fuel at low or idling speeds and still presents a sufficient area to the low suction pressure to effect the initial movement of the valve as speed is increased.

As the suction pressure is increased due to increased engine speed the valve moves toward maximum speed restricting position. In order that the resistance of the linkage be great enough to counteract the effect of the suction pressure at the maximum speed and thus hold the valve in equilibrium at this speed, it is necessary that the resistance of the linkage increases as the valve moves toward closing. In my invention this is accomplished by the action of spring 41 pivoting about capscrow 42. When the initial suction pressure begins to act on the valve 17, the lower end of spring 41 will be moved to the right due to the movement of the intermediate linkage. In this initial movement there is little or no force exerted on the spring tending to expand the coils since the outer end of the spring is merely traveling in an arc about the capscrow 42.

However, as the swinging continues, the end of the effective arc of the unstretched spring is reached and the resistance of the coils to expanding must be overcome for further movement of the valve. Therefore it may be seen that, as the suction of the engine increases and tends to further swing the valve, the inclination of the spring 41, as shown in Figure 3, and the expansion thereof increases with a corresponding increase in the resistance to the swing of the valve. As the engine reaches its predetermined maximum speed, the resistance of spring 41 will increasingly tend to counterbalance the valve movements and to hold the valve to maintain the proper passage for the desired maximum speed.

For any definite engine speed there is a critical setting of valve 17 at which further closure of the valve will decrease the flow of fuel to the engine and consequently throttle down the speed. The higher the speed the greater the opening of the fuel passage must be at the critical setting since higher speeds require more fuel than lower speeds. However, the high suction pressures at high speeds tend to cause a more restricted opening than do the suction pressures at low speeds. It is therefore necessary that the resistance of

5

the linkage increase more rapidly for a high maximum speed limit adjustment than for a low maximum limit, in order that the higher suction pressure may be absorbed by the time the critical valve setting is reached. However, the resistance of the linkage to the initial movement of the valve 17 from its non-restricting position still should remain substantially at a minimum to insure that the valve will begin to swing under the suction of the manifold pressure.

To accomplish this result I have provided a spring-tension adjusting block 44. By unscrewing the cap screw 45 the block 44 may be adjusted to the right or to the left. When moved to the left the shoe 44' of block 44 abuts the spring 41 and increases the resistance of the spring when it is deflected toward the right by the connected linkage. The further the shoe 44' is positioned to the left against spring 41 the greater will be the spring resistance which the suction pressure has to overcome after the initial movement of the valve 17. Thus, by increasing the effective loading of the spring 41, the high suction pressure of a high maximum speed setting can be absorbed and still cause the valve 17 to assume a less restrictive position in the fuel passage than it would for a low maximum speed setting.

This result is accomplished without destroying the pivoting action of the spring 41 which gives the very desirable effect of a gradual increasing resistance. Therefore, at all maximum speed settings, the increasing resistance of the linkage mechanism prevents abrupt movement of the valve to the maximum restricting position and permits the engine to be properly brought up to the desired speed before the movement of the valve is arrested.

From the foregoing it is apparent that I have a simple and readily adjustable mechanism for varying the spring loading of the linkage and also for enabling adjustment of the linkage itself in accordance with predetermined desired conditions of engine effectiveness at given speeds.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a governor for controlling the valve in the intake manifold of an internal combustion engine, a linkage for moving the valve, a fixed casing providing a spring anchor, a helical spring having one end secured to said anchor and the other end to said linkage, said anchor being dis-

6

posed relative to the path of said linkage so that said spring is elongated and angularly shifted by movement of said linkage in one direction, and means adjustably mounted on said casing in the path of angular movement of said spring so as to be laterally contacted by said spring, whereby the resistance of said spring to the movement of said linkage in said direction may be selectively increased as a function of the position of said last mentioned means.

2. In a governor for controlling the butterfly valve in the intake manifold of an internal combustion engine, a linkage for moving said valve, a fixed casing providing a spring anchor, a helical spring having one end secured to said anchor and the other end connected to said linkage, said anchor being disposed relative to the path of said linkage so that said spring is elongated and angularly shifted by movement of said linkage in one direction, a block slidably mounted on said casing in position to be laterally contacted by said spring, and means for selectively securing said block to said casing in any one of a plurality of positions relative to said spring, whereby the loading of said spring is increased as a function of the position of said block.

3. The combination defined in claim 2 wherein said linkage includes an adjustably extensible link for selectively varying the initial position of the valve relative to said spring.

4. In a governor of the type wherein the action of a pressure responsive valve positioned in the fuel path of an engine intake is resisted by a mechanical linkage, the combination of a coil spring connected to impart resistance to the linkage, said spring being constructed and arranged to be extended and angularly shifted by movement of the linkage in one direction, and a block adjustably positioned in the path of angular movement of said spring to be laterally contacted by said spring, whereby the maximum restraining effects of said spring are increased as a function of the position of said block without substantially increasing the minimum restraining effect of said spring on the linkage.

FRANK A. ZIMMERMAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,889,706	Singer	Nov. 29, 1932
2,170,744	Adler	Aug. 22, 1939
2,209,374	Anderson	July 30, 1940