

UNITED STATES PATENT OFFICE

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ENGINE GOVERNOR

Marion Mallory, Detroit, Mich.

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4 Claims. (Cl. 123—103)

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This invention relates to a speed governor for an internal combustion engine.

It is the object of this invention to produce a governor for controlling the speed of an internal combustion engine which is of very simple structure, and efficient in operation.

Fig. 1 is a top plan view of my governor.

Fig. 2 is a side elevation partly in section of my governor taken along the line 2—2 of Fig. 1.

Fig. 3 shows a modified form of my governor.

Fig. 4 shows a second modified form of my governor.

My governor comprises the following parts: governor housing 1 having an inlet 2 and an outlet 3 to the engine intake manifold, intake passageway 4, throttle valve 5 of the butterfly type, valve shaft 6, arm 7 on shaft 6, connecting rod 8 connecting crank 7 with flexible diaphragm 9, tension spring 10 connected at one end to rod 8 and at the other end to anchor post 11, suction device 12, suction chamber 13, atmosphere chamber 14, orifice 15 and orifice 16 in intake passageway 4, conduit 17, branch conduit 18 and branch conduit 19 connecting orifice 16 with suction chamber 13, branch conduit 20, branch conduit 21 connecting orifice 15 into conduit 17, needle valve 22 having a screw fit in bore 23 as at 24 and needle valve 25 having a screw fit in bore 26 as at 27. Needle valve 22 controls the communication between orifice 15 and suction chamber 13 and needle valve 25 controls communication between orifice 16 and suction chamber 13.

The outer end of conduit 17 can be closed by a fitting 28, but since my governor can be used with the engine driven centrifugally unbalanced valve air bleed mechanism shown in my copending application Serial No. 466,961, filed November 25, 1942, now Patent 2,381,550, issued August 7, 1945, I have shown conduit 29 for connecting conduit 17 with such centrifugally unbalanced valve air bleed mechanism.

The operation of my device is as follows: When the governor throttle 5 is closed both orifices 15 and 16 are located in the high suction zone on the engine side of valve 5, but as valve 5 moves toward open position orifice 16 becomes located on the atmospheric side of valve 5. Assuming that the governor is set to govern the engine at 3000 R. P. M. and the engine is running at its governed speed with no load, valve 5 will be in the position shown in Fig. 2, that is, almost closed, and orifice 16 will be in the high suction zone which imposes high suction on the suction device, that is, in chamber 13 and on diaphragm

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9. As soon as the load is applied to the engine, the engine will slow down somewhat and there will be a slight drop in the vacuum in the intake passageway between the governor valve and engine. As the vacuum in the intake passageway on the engine side of valve 5 falls so will the vacuum in suction chamber 13 fall and consequently tension spring 10 will start to move valve 5 toward an open position and orifice 16 will pass to the atmosphere side of valve 5 and serve as an air bleed to suction chamber 13 which rapidly reduces the vacuum in chamber 13 and causes the governor valve to open rapidly. This will admit more charge to the engine and the engine will again return to its governed speed.

The fluid flow through intake passageway 2 by orifices 15 and 16 will establish sufficient vacuum in chamber 13 to start valve 5 to close whenever the engine tends to exceed its governed speed as the load is varied. Further, orifice 15 is always on the engine side of valve 5 and benefits by the Venturi action or velocity effect created by the flow of motive fluid through the intake passageway and by the left hand side of valve 5. The effective vacuum established in chamber 13 through orifice 15 can be adjusted through valve 22 and similarly the effective vacuum or the effective air bleeding of chamber 13 through orifice 16 can be regulated by adjusting valve 25.

It will also be noted that orifice 16 is positioned with respect to the right hand portion of valve 5 so that valve 5 in opening and closing, as it approaches and becomes opposite orifice 16, co-operates with the wall of the intake passageway to speed up the flow of fluid by orifice 16 and create a Venturi effect.

In the modified form of my governor conduit 17, instead of being closed by fitting 28, is connected by conduit 29 to a centrifugally unbalanced valve air bleed mechanism. This mechanism comprises valve housing 30 on engine driven distributor shaft 31, air bleed orifice 32, centrifugally unbalanced valve 33, tension spring 34 tending to hold said valve open, bypass passageway 35, T passageway 36, and circumferential passageway 37 communicating with conduit 29, outlet 40 to atmosphere in distributor housing 41.

The operation of my governor is as follows: Assuming the engine is started under no load, valve 5 will be wide open and the engine will accelerate to its governed speed whereupon centrifugally unbalanced valve 33 will close orifice 32 and thereby cut off the air bleed to chamber 13 so that the velocity of the motive fluid

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by orifices 15 and 16 will create a vacuum in chamber 14 causing diaphragm 9 to move valve 5 toward closed position to cut down the charge to the engine so that it will not overrun its governed speed. In passing from open to partly closed position valve 5 will swing by orifice 16 and cause orifice 16 to function in the manner above described with respect to the principal form of the invention. Centrifugal valve 33 closes against the intake passageway suction. As throttle 5 moves toward closed position to throttle the charge, the engine will slow down slightly and valve 33 will open slightly and ride the vacuum to thereby vary the effective opening of air bleed opening 32 sufficiently to maintain proper pressure conditions in chamber 33 so that diaphragm 9 will respond to open or close throttle valve 5 to vary the charge to the engine to maintain the governed speed under varying load conditions.

Orifice 16 can be located slightly above (Fig. 4) or in line with the right hand portion or tip of throttle 5 when in idle or in substantially closed position because the suction on this orifice will increase when the valve moves toward closed position owing to the fact that the air velocity by the valve increases as it moves toward closed position. In other words, since the air velocity is always high around the valve tip, there will be a high suction on any orifice placed close to the throttle valve tip when the throttle valve is nearly closed. As valve 5 moves toward closed position the right hand tip of throttle valve 5 (Fig. 2) moves toward orifice 16 and the suction at orifice 16 increases due to this Venturi effect and as valve 5 opens the right hand tip of valve 5 moves away from orifice 16 and the Venturi effect and the suction created thereby decreases. Consequently, this rise in suction accelerates the closing of valve 5 and the fall in suction accelerates the opening of valve 5 thus avoiding any substantial surging of the engine speed. It is this quick response of throttle valve 5 as the engine approaches or falls away from its governed speed which maintains the engine at its governed speed without any substantial variation. If throttle valve 5 were sluggish in responding to variations in engine speed, then the engine speed might rise or fall several hundred revolutions per minute above or below the governed speed as the load on the engine were varied. My governor obviates this undesirable feature.

I claim:

1. A governor for an internal combustion engine having an intake passageway, a throttle valve in said passageway for controlling the flow of motive fluid to said engine, a pressure actuated device responsive to changes in pressure in the intake passageway, a connection between said pressure actuated device and said throttle valve whereby as the pressure falls in said pressure actuated device the device tends to move said throttle valve toward closed position, first and second orifices in the intake passageway on the engine side of said throttle valve when in nearly closed position, said orifices communicating with said pressure actuated device, the second of said orifices being positioned adjacent the throttle valve whereby as the throttle valve opens, the second orifice passes on to the atmosphere side of said throttle valve and tends to serve as an air bleed orifice to said pressure actuated device, resilient means tending to open said throttle valve, a third orifice constituting an air bleed for said pressure actuated device, a valve centrifugally controlled in ac-

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cordance with engine speed for controlling said third air bleed orifice, said centrifugal valve tending to close said third orifice at a predetermined engine speed whereby said pressure actuated device responds to intake passageway pressure and moves said governor valve toward closed position.

2. A governor for an internal combustion engine having an intake passageway, a throttle valve in said passageway for controlling the flow of motive fluid to said engine, a pressure actuated device responsive to changes in pressure in the intake passageway, a connection between said pressure actuated device and said throttle valve whereby as the pressure falls in said pressure actuated device the device tends to move said throttle valve toward closed position, first and second orifices in the intake passageway on the engine side of said throttle valve when in nearly closed position, said orifices communicating with said pressure actuated device, the second of said orifices being positioned adjacent the throttle valve whereby as the throttle valve opens, the second orifice passes on to the atmosphere side of said throttle valve and tends to serve as an air bleed orifice to said pressure actuated device, resilient means tending to open said throttle valve, a valve housing rotated in accordance with the speed of the engine and having a port to atmosphere, a conduit connecting the pressure actuated device with said valve housing, and a centrifugally unbalanced valve mounted in said housing for radial movement toward and away from the axis of rotation of said housing and tending to close said port to atmosphere whenever the engine attains its governed speed whereby the pressure actuated device responds to move said governor valve toward closed position, and resilient means tending to hold said valve open in opposition to the centrifugal force which moves the valve toward closed position as the engine attains its governed speed.

3. A governor for an internal combustion engine having an intake passageway, a throttle valve in said passageway for controlling the flow of motive fluid to said engine, a pressure actuated device having a vacuum chamber and responsive to changes in pressure in the intake passageway, a connection between said pressure actuated device and said throttle valve whereby the pressure actuated device imparts movement to said valve, first and second orifices in the intake passageway and positioned on opposite sides of the axis of pivoting of said valve, said orifices communicating with the vacuum chamber of said pressure actuated device, the first orifice remaining on the engine side of said throttle valve at all times and the second orifice being positioned adjacent to the tip of the throttle valve when in idle position whereby as the throttle valve moves toward idle position the air velocity by said second orifice and the suction created on said second orifice thereby, increase and whereby when the throttle valve is opened from idle position the second orifice is on the atmosphere side of said throttle valve and tends to serve as an air bleed to said pressure actuated device thereby assisting in the opening of said throttle valve, and resilient means tending to open said throttle valve, a third orifice constituting an air bleed for the vacuum chamber of said pressure actuated device, a valve centrifugally controlled in accordance with engine speed for controlling said third air bleed orifice, said centrifugal valve tending to close said third orifice whenever the engine attains its governed speed whereby said pressure

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actuated device responds to intake passageway pressure and moves said governor valve toward closed position.

4. The governor claimed in claim 3 wherein said second orifice remains on the atmosphere side of the throttle valve at all positions of the throttle.

MARION MALLORY.

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

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