Sept. 26, 1944. M. MALLORY 2,359,230

GOVERNOR

Filed May 29, 1942

FIG. 2.

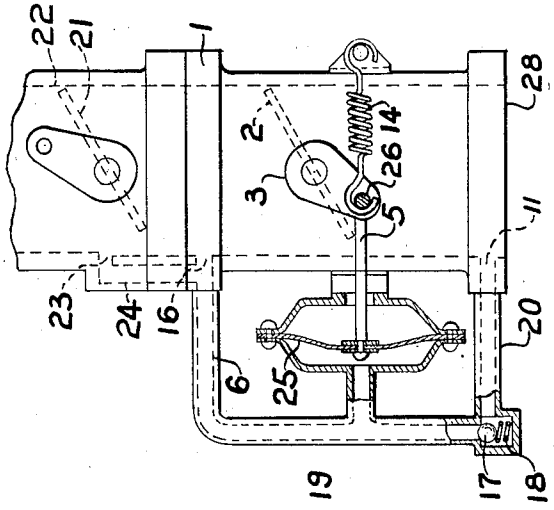
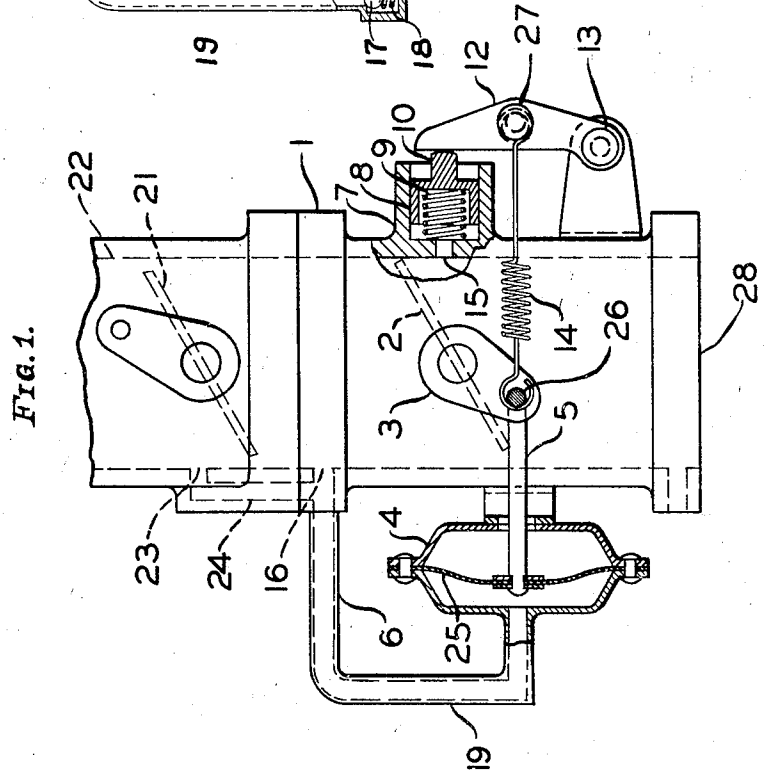


FIG. 1.



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GOVERNOR

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

It is well known that in the present day governors, both the centrifugal governor as well as the type operated by the velocity of the fluid flowing through the intake passageway, it has been difficult to obtain satisfactory performance. One of the reasons is that the present day governors do not respond immediately to the load increase of the engine. For example, if the vehicle was governed at 40 miles per hour and was running on a level road with light load, it would be necessary to have the governor valve nearly closed so that the charge would be held down to prevent the vehicle from speeding above 40 miles per hour. Assuming the 40 miles per hour speed was 2500 revolutions per minute of the engine, if the vehicle would start up a slight hill, the governor valve should start to open immediately or as soon as the engine started to lose speed, but the present governor does not open quick enough to give the engine sufficient charge to maintain its speed when a light load is applied to the engine. Consequently, the speed of the engine must drop to a point far below its governed speed before the governor valve will open wide enough to give the engine a full charge.

To overcome this, others have adjusted or set the governors so that the engine would run much higher revolutions per minute under free load or light load than at full load. For example, if the desired governor speed was 40 miles per hour with the engine running at 2500 revolutions per minute, the governor would be set so that the engine would run 3500 revolutions per minute with no load, and, if a light load were applied, the governor would not become wide open until the engine slowed down to 2500 revolutions per minute. Consequently, the engine would have a load governed speed at 2500 revolutions per minute and no load governed speed at 3500 revolutions per minute. In other words, the engine was governed at a much higher speed at no load than at full loads.

One of my objects is to overcome this so-called over-run when the engine is running at no load. Other new features will be explained in the specification.

Fig. 1 is an elevational view partly in section showing the governor.

Fig. 2 shows a modified form of the invention.

In the drawing 1 is the governor housing. 2 is a governor valve of the butterfly type pivotally mounted on a shaft in the intake passageway 22. 3 is an arm connected to the governor valve 2 for operating the same. 4 is a suction device having a diaphragm 25. 5 is a link that connects the diaphragm 25 to the valve arm 3. 6 is a conduit that connects the suction device 4 into the intake passageway 22 at orifice 16. Conduit 6 also communicates with the intake passageway 22 by means of orifice 23 and conduit 24. Orifice 23 is positioned on the atmosphere side of throttle valve 21 and orifice 16 is positioned on the engine or intake manifold side of throttle valve 21. 7 is a cylinder having reciprocably mounted therein piston 8. 9 is a compression coil spring that tends to hold piston 8 towards the outer or right hand end of the cylinder 7. 10 is an extension on piston 8 that contacts arm 12. Arm 12 is pivoted on an extension of the housing 1 as at 13. Tension spring 14 is connected at one end to the governor valve arm 3 as at 26 and at the other end to arm 12 as at 27. Spring 14 tends at all times to open governor valve 2. 15 is an orifice connecting cylinder 7 into the intake passageway 22 between the governor valve 2 and the engine or fuel mixture outlet end 28 of housing 1. This concludes the description of the principal form of the invention.

The operation of the principal form of the invention is as follows: Referring to the drawing, assuming the engine is idling, there will be a suction or vacuum between throttle valve 21 and the engine which communicates through orifice 16 and conduit 6 to the suction device 4. This suction or vacuum communicating with the diaphragm 4 through conduit 6 tends to hold the governor valve 2 towards a closed position. If valve 21 is held wide open to accelerate the engine, the suction at orifice 16 will diminish, causing valve 2 to fly wide open and the engine will receive a full charge. As the speed of the engine increases, the velocity of the charge flowing into the engine also increases and creates a suction on orifices 23 and 16 and a suction through conduit 24 and 6 on the suction device or diaphragm 25. This suction acting through diaphragm 25, link 5 and arm 3 moves valve 2 towards a closed position, and due to the fact that the lower part of valve 2 is shorter than the upper part, which makes it slightly unbalanced, there will be a vacuum created between it and the engine as soon as it starts to close. This vacuum influences valve 2 to close further.

Supposing the engine was running at its governed speed at light load on a level road and valve 2 was at position shown in the drawing, the vacuum at orifice 15 will be high, which would

hold piston 8 inwardly against spring 9, permitting arm 12 to move inwardly, decreasing the tension on spring 14. If the vehicle would come to a hill, the engine speed would slow down slightly. The slowing down of the engine would cause a decrease in suction at orifice 15, and spring 9 would force piston 8 and projection 10 outwardly against arm 12, increasing the tension on spring 14, which would open valve 2 to give the engine more charge. As soon as the engine picked up speed and again reached its governed speed, the suction would increase at orifice 15, drawing piston 8 inwardly and decreasing the tension on spring 14.

To open valve 2 further, I use supplementary means in addition to spring 14. When the engine starts to slow down, the suction naturally lowers between valve 2 and the engine and piston 8 will move outwardly against arm 12, thereby swinging arm 12 outwardly about pivot 13 which increases the tension on spring 14. As the tension on spring 14 increases, spring 14 opens valve 2 wide enough to permit sufficient charge to the engine to maintain the desired governed speed.

This supplementary means also prevents the engine from overspeeding when the engine is not in gear, because as the speed increases the vacuum will increase in the intake passageway on the engine side of valve 2 and in the cylinder 7 thereby causing piston 8 to move toward the left to compress spring 9 more tightly and decrease the tension on spring 14. As the tension on spring 14 decreases, the suction on diaphragm 25 will cause valve 2 to close further.

Instead of supplementary means comprising cylinder 7, piston 8, spring 9, orifice 15, and pivoted arm 12, other supplementary means may be used for controlling governor valve 2. These supplementary means, as shown in Fig. 2, take the form of orifice 11 on the engine side of valve 2, conduit 20, ball check valve 17, compression spring 18, and conduit 19 which communicates with conduit 6. Ball check valve 17 tends to close off conduit 20 from conduit 19.

With this modified form of supplementary means if the vehicle were running at light load and the engine at its governed speed, valve 2 would be almost closed and the vacuum would be high at orifice 11, which would hold ball check valve down away from its seat, compressing spring 18 and placing conduits 20 and 19 in communication.

Now, if a load were applied to the engine by the vehicle starting to climb a hill, the vacuum would decrease at orifice 11 due to the engine speed decreasing slightly. When the vacuum decreases slightly at orifice 11, the spring 18 forces the valve 17 back on its seat thereby shutting off conduit 20 from conduit 19 and accordingly decreasing the vacuum in the suction chamber 4 which permits tension spring 14 to open valve 2. If the engine was overspeeded, check valve 17 would be drawn downwardly causing a higher suction in the suction device 4 which would pull valve 2 towards a closed position.

The two above described supplementary means for maintaining the desired governed speed are herein shown in conjunction with a governer having an unbalanced valve 2 and a suction controlled device 4, but it is specifically understood that either of these supplementary means for maintaining the desired governed speed of the engine can be used in conjunction with other types of governors. For example, if the conventional velocity type governor is used where only the unbalanced valve itself closes and opens by the pressures in the intake passageway, the cylinder 7, piston 8, spring 9, projection 10, arm 12 and orifice 15 can be used to assist the governor valve to open when the engine load is increased. If a suction device is used to assist the opening of the governor valve, the ball check 17, spring 18, conduit 20 and orifice 11 can be used to assist the opening when the load is increased. It will also be understood that either the piston or ball check principle assists the closing of the governor valve 2 when the engine load is decreased, as well as assists the opening of said valve when the load of the engine is increased.

As the main object of the invention is to oppose or render the intake pressures that control the governor valve less effective at heavy engine loads than at lighter engine loads, it is practically impossible to show the many different means of accomplishing this. Therefore, I am submitting only the one drawing.

The vacuum increase and decrease at orifice 15 and 11 are more or less in relation to engine speed when the speed is entirely controlled by the governor valve 2, and due to the fact that this is true, I do not wish to be limited to controlling the check valve 17 by vacuum.

I claim:

1. A device for controlling the speed of an internal combustion engine having an intake passageway comprising a main throttle valve in said intake passageway, a governor valve in said intake passageway on the down-flow side of said main throttle valve, resilient means tending to open said governor valve, a suction device connected to said governor valve tending to close the said governor valve in opposition to said resilient means, one side of said suction device being subject to atmospheric pressure at all times and a conduit connected to the other side of said suction device and communicating with the intake passageway through an orifice on the atmosphere side of said main throttle valve, said orifice being located adjacent said main throttle valve so as to be affected by the Venturi action thereof whereby the vacuum created by the fluid flow past said orifice at a predetermined speed acts on said suction device to move the governor valve towards closed position.

2. The combination as claimed in claim 1 wherein the said conduit is connected to the said suction device and communicates with the intake passageway through spaced orifices, one orifice positioned on the atmosphere side of the said main throttle valve and the other orifice being positioned between the main throttle valve and the governor valve.

3. A device for controlling the speed of an internal combustion engine having an intake passageway comprising a main throttle valve in said intake passageway, a governor valve in said passageway on the down-flow side of said main throttle, an arm connected to said governor valve, a spring acting on said arm tending to open said governor valve, a suction device connected to said governor valve tending to close the governor valve in opposition to said spring, one side of said suction device being continuously subject to atmospheric pressure and a conduit connected to the other side of said suction device and communicating with the intake passageway at an orifice on the atmosphere side of the said main throttle valve, said orifice being located adjacent said main throttle valve so as to be affected by the Venturi action thereof whereby fluid flow by

said orifice lowers the pressure within said suction device and causes the suction device to move said governor valve toward closed position.

4. A device for controlling the speed of an internal combustion engine having an intake passageway comprising a governor valve in said passageway arranged to move toward closed position as the speed of the engine reaches a predetermined speed, and resilient means for opening said governor valve when the speed of the engine falls below said predetermined speed, a suction device connected into the intake passageway on the engine side of the governor valve and responding to a decrease in the vacuum on the engine side of said governor valve to increase the effective force of said resilient means tending to open said governor valve and responding to a rise in the vacuum in said intake passageway on the engine side of said governor valve to decrease the effective force of said resilient means applied to said governor valve, said suction device acting only through said resilient means to influence the opening and closing of said governor valve.

5. The combination as claimed in claim 4 wherein the resilient means comprises a spring and the said suction device operates to increase the force of the spring tending to open said valve as the vacuum between said governor valve and engine decreases and to decrease the said force of said spring as the vacuum between said governor valve and engine increases.

6. The combination as claimed in claim 3 including a suction device connected into the housing between said governor valve and engine, said suction device operating to increase the force of the spring tending to open said valve as the vacuum between said valve and engine decreases, and to decrease the force of said spring tending to open said governor valve as the vacuum between said governor valve and engine increases.

7. The combination as claimed in claim 1 including a conduit connected to the suction device and communicating with the intake passageway through an orifice on the engine side of said governor valve, a check valve in said last-mentioned conduit, resilient means for closing the check valve when the vacuum is low between the said governor valve and engine whereby when the vacuum is increased between said governor valve and engine the check valve will be opened and the intake manifold vacuum on the engine side of the governor will be applied to said suction device.

8. A device for controlling the speed of an internal combustion engine having an intake passageway comprising a governor valve arranged to close as the speed of the engine reaches a predetermined speed and to open as the speed of the engine falls below said predetermined speed, a suction device connected to said governor valve, a conduit connecting the suction device with the intake passageway through an orifice positioned on the engine side of said governor valve, a valve for shutting off the suction device from said orifice when the vacuum between the governor valve and engine reaches a predetermined low value, said suction device being in communication with the intake passageway and responding to a predetermined high vacuum between the said governor valve and engine to assist in the closing of the said governor valve.

9. The combination as claimed in claim 8 wherein resilient means are connected to said governor valve and tend to open the same whereby the said suction device increases the effective force of said spring tending to open the governor valve whenever the vacuum between the governor valve and engine falls below a predetermined low vacuum.

10. A device for controlling the speed of an internal combustion engine having an intake passageway comprising a governor valve in said passageway arranged to close as the speed of the engine reaches a predetermined speed and to open as the speed of the engine falls below said predetermined speed, a suction device connected to said governor valve, a conduit connecting the suction device with the intake passageway on the engine side of said governor valve, a check valve in said conduit controlled by suction in the intake passageway to open wider as the suction is increased due to closing of the governor valve whereby the suction obtaining in the intake passageway on the engine side of the governor valve is impressed upon the suction device thereby moving the governor valve toward closed position.

11. A device for controlling the speed of an internal combustion engine having an intake passageway comprising a governor valve in said passageway arranged to close as the speed of the engine reaches a predetermined speed and to open as the speed of the engine falls below said predetermined speed, a suction device connected to said governor valve, a conduit connecting the suction device with the intake passageway on the atmosphere side of said governor valve, a second conduit connecting the suction device with the intake passageway on the engine side of said governor valve, a check valve in said second conduit controlled by suction in the intake passageway to open as the suction is increased due to closing of the governor valve whereby the suction obtaining in the intake passageway on the engine side of the governor valve is impressed upon the suction device thereby moving the governor valve toward closed position.

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