

Aug. 22, 1944.

M. MALLORY

ENGINE GOVERNOR

Filed June 8, 1942

2,356,679

4 Sheets-Sheet 1

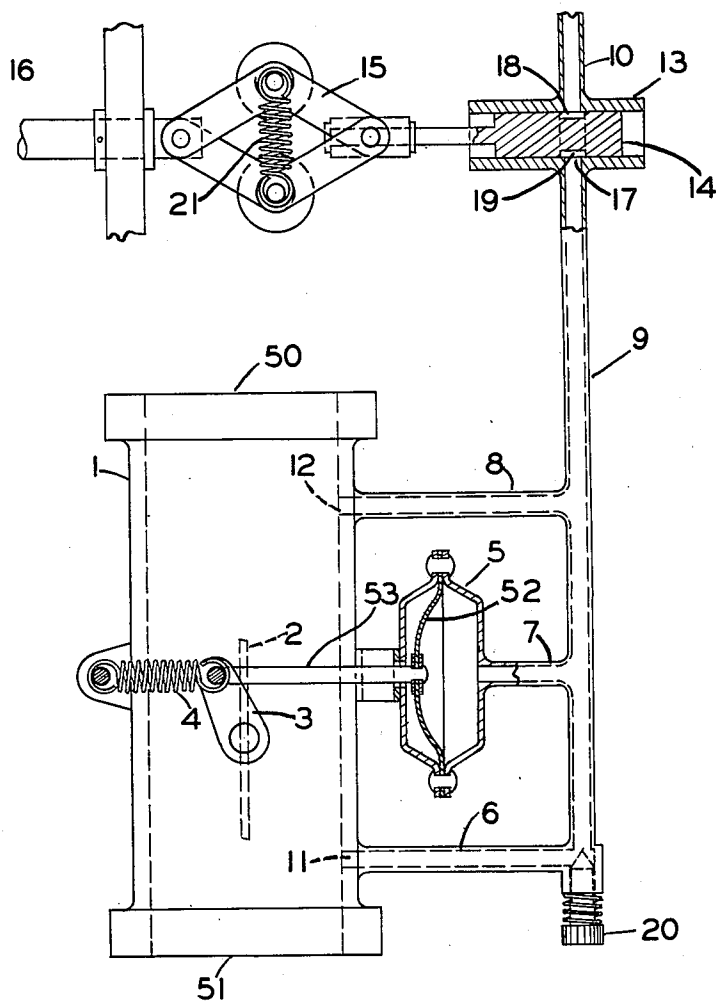


FIG. 1.

INVENTOR.

MARION MALLORY

BY *Barnes, Kisselle, Laughlin & Rainsch*

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4 Sheets-Sheet 2

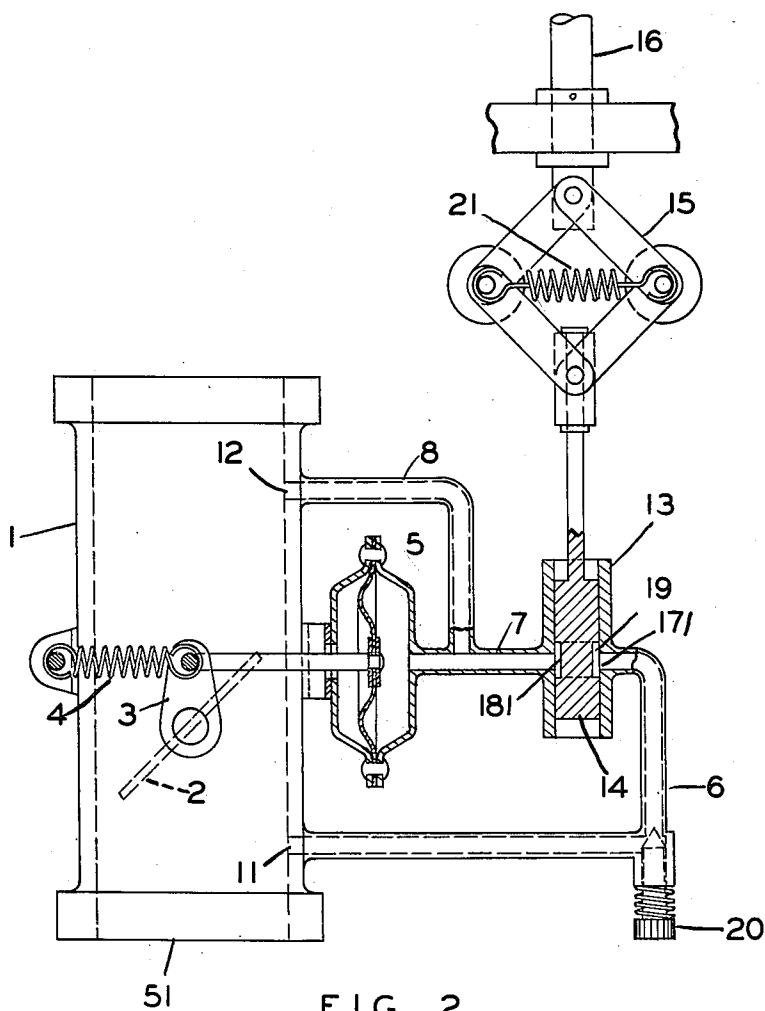


FIG. 2

INVENTOR.

MARION MALLORY

BY

Barnes, Kiesel, Laughlin & Reisch

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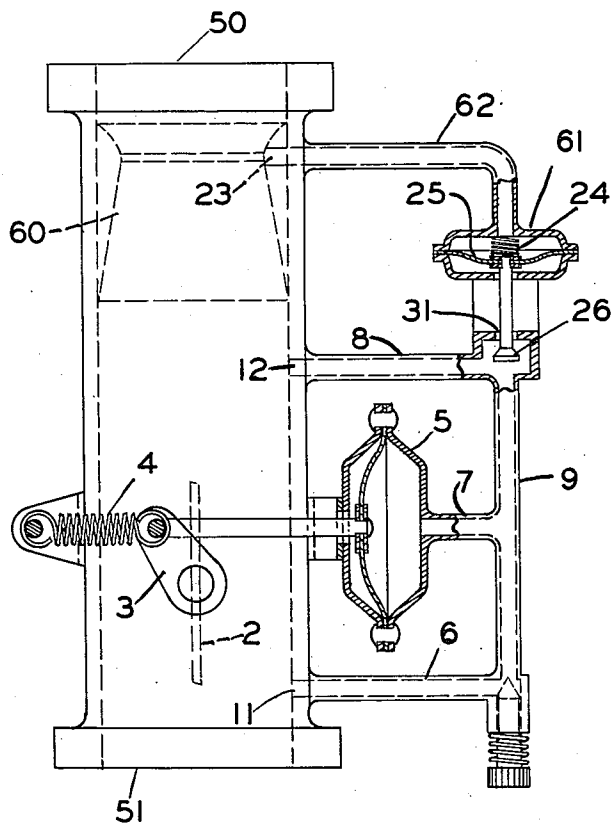


FIG. 3

MARION MALLORY INVENTOR.

BY Barnes, Kisselle, Laughlin & Raisel

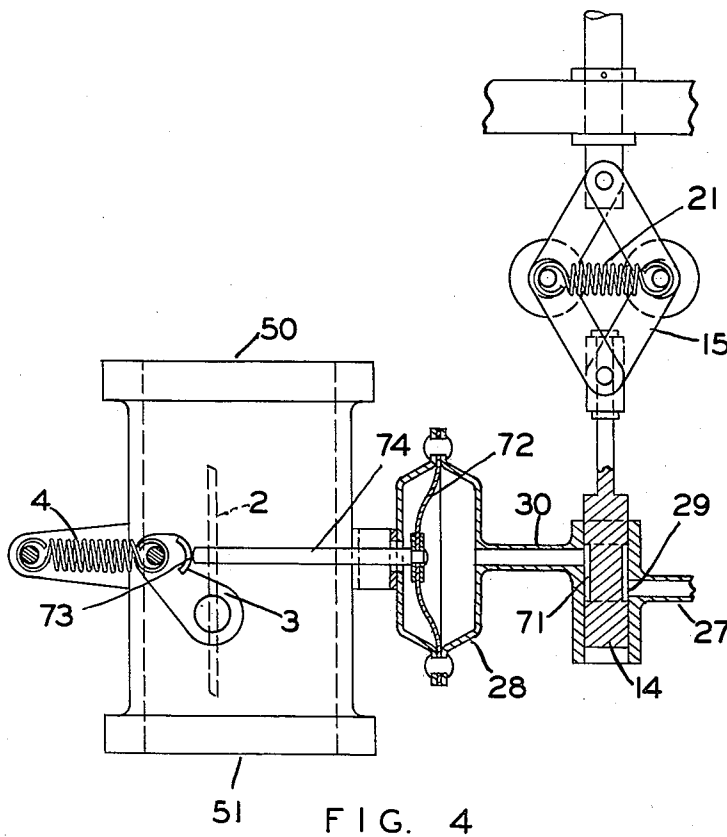
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M. MALLORY
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4 Sheets-Sheet 4



INVENTOR.
MARION MALLORY

BY *Barney Kisselle Laughlin & Raisel*

UNITED STATES PATENT OFFICE

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ENGINE GOVERNOR

Marion Mallory, Detroit, Mich.

Application June 8, 1942, Serial No. 446,243

6 Claims. (Cl. 123—103)

This invention relates to a governor for controlling the speed of 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 considerably more efficient in operation and more simple than governors heretofore known.

This invention contemplates an engine governor which will control the speed of an internal combustion engine at any predetermined desired speed with greater precision and nicety than heretofore possible.

In the drawings:

Fig. 1 is an elevation partly in section showing one form of my engine speed governor.

Figs. 2, 3 and 4 are also elevations partly in section showing modified forms of my engine speed governor.

In Fig. 1, 1 is a governor housing which is adapted to be connected into the engine intake passageway. The inlet is designated 50 and the outlet 51. 2 is a governor valve of the butterfly type mounted on a shaft within the housing 50. 3 is the governor valve arm fixed on the shaft outside the housing. 4 is a tension spring connected at one end to the arm 3 and the other end to the housing 1 which tends to hold the valve 2 open. 5 is a suction device provided with a diaphragm 52 which is connected by rod 53 with arm 3. 6, 7, 8, 9 and 10 are conduits. Conduits 6 and 8 communicate with the intake passageway through orifices 11 and 12 respectively. Communication between conduits 9 and 10 is controlled by a valve comprising cylinder 13 and piston 14. Piston 14 is controlled by a centrifugal governor 15 which is rotated or driven by governor shaft 16 which is driven by the internal combustion engine. Conduit 9 communicates with the cylinder 13 through orifice 17 and conduit 10 communicates with the cylinder 13 through orifice 18. The other end of conduit 10 communicates with atmosphere. Piston valve 14 is provided with a circumferential groove 19. Communication between conduits 6 and 9 is controlled by an adjustable valve 20. The centrifugal governor 15 is provided with the usual tension spring 21 which tends to collapse the same.

The operation of the device is as follows: It is understood that this governor can be used for controlling the speed of any type of internal combustion engine whether a carbureted engine or an injection engine.

The governor valve 2 as shown in the drawing is at its wide open position, which would give

the engine a full charge. If the engine speed would increase to a point that would cause governor 15 to expand, piston valve 14 would move to the left and close communication between orifices 17 and 18, and the velocity of the fluid or fuel mixture charge flowing by orifices 11 and 12 would create a suction in conduits 6, 7, 8 and 9, which would cause a suction in suction device 5 and draw valve 2 towards a closed position. As valve 2 moved towards a closed position against the tension of spring 4, the suction would increase between it and the engine (i. e., outlet 51) and in turn the suction would be higher at orifice 11, which would make the suction device more powerful, drawing valve 2 further closed until the engine would be throttled to its desired governor speed.

Now assuming a slight load was applied to the engine, the speed would drop slightly and spring 21 would cause governor 15 to contract and move piston valve 14 to the right so that circular groove 19 would communicate with orifices 17 and 18. The suction or vacuum in suction device 5 would then be bled to the atmosphere through conduits 9 and 10. Naturally, the suction device would have little power when bled to the atmosphere and spring 4 would move valve 2 back to its open position, giving the engine more charge so that it could maintain its speed.

When the engine reached its governed speed again, governor 15 would cause piston valve 14 to shut off the air bleed (9, 17, 18, 10) so that the suction would increase at suction device 5 and valve 2 would move towards a closed position.

To adjust the governor to give the desired speed of the engine, the procedure is as follows:

A spring 21 is used of such tension to hold the centrifugal governor contracted until the engine has reached the speed it is to be governed at; say, for example, 2800 R. P. M. At this speed, governor 15 will have expanded, pulling piston 14 leftward or towards the governor, closing off the atmospheric bleed of conduit 9. The suction created at orifices 11 and 12 will immediately build up the suction in the suction device 5 and start governor valve 2 towards a closed position. As the governor valve 2 moves towards a closed position, the vacuum between it and the engine will increase, causing an increased vacuum at orifice 11 and in suction device 5. After valve 14 has closed the atmospheric communication between conduits 10 and 9, the suction at orifices 11 and 12 controls the governor. Even though governor 15 shuts off the atmospheric bleed at 2800 engine speed, the engine might run as high as 3500

R. P. M. at no load, and to bring this speed down close to 2800 R. P. M. or governor speed, valve 20 should be adjusted towards an open position so that the vacuum will be increased on the suction device. By adjusting valve 20, the no load speed can be brought down within 100 or 150 revolutions of the governor speed, i. e., the point that the centrifugal governor 15 closes the communication between conduits 10 and 9. If the no load speed is adjusted to be only 100 or 150 revolutions higher than the speed at which the centrifugal governor closes communication between conduits 9 and 10, governor valve 2 will start to open almost immediately if load is applied to the engine sufficient to cause a decrease in engine speed, because if the no load speed was 2950 and load was applied to cause the engine to slow down slightly, the centrifugal governor 15 would contract, bleeding suction device 5 to the atmosphere and permitting valve 2 to immediately open.

The charge passing by orifice 12 and 11 creates a suction in the suction device as soon as governor 15 closes the communication between conduits 9 and 10, but as soon as governor valve 2 moves towards a closed position, orifice 11 is in a much lower pressure than orifice 12. Therefore, orifice 12 plays the role of an air bleed to orifice 11, and the more adjusting valve 20 is closed, the greater is the air bleeding effect of orifice 12 to orifice 11; vice versa, the more adjusting valve 20 is open, the less effect orifice 12 has in bleeding orifice 11. If desired, adjusting valve 20 could be located in conduit 8, and by closing it, the suction on diaphragm 5 would increase. The adjusting valve 20 is very desirable because it makes it unnecessary to adjust the governor valve spring 4. If the adjusting valve 20 is moved towards a closed position, it reduces the power of suction device 5 which is equivalent to increasing the tension of spring 4. If the valve 20 is moved towards an open position it increases the power of suction device 5 which is equivalent to decreasing the tension of spring 4. Conduit 8 and orifice 12 are desirable, but the governor will operate successfully if conduit 8 and orifice 12 are omitted.

In Fig. 2 the principle of the governor is the same. In this form of the invention valve 13, which is controlled by the centrifugal governor 14, is positioned between conduits 7 and 6. Conduit 7 communicates with cylinder 13 through orifice 181 and conduit 6 communicates with cylinder 13 through orifice 171. When governor 15 reaches a speed that the engine is to be governed at, valve 14 is moved upwardly to the position shown causing communication between suction device 5 and orifice 11, through conduits 6 and 7, orifices 171 and 181, and circumferential groove 19. This causes an increase in suction on the suction device and moves valve 2 towards a closed position, but if a load is applied to the engine, causing the R. P. M. to fall slightly below the governed speed, governor 15 will contract and close valve 13, 14 which shuts off communication between diaphragm 5 and orifice 11. This decreases the suction on the suction device and spring 4 will move valve 2 towards an open position. It will be understood that when valve 14 closes the communication between suction device 5 and orifice 11, orifice 12 plays the role of an air bleed through conduit 8 to the suction device 5.

Fig. 3 shows another modified form of the invention shown in Fig. 1. The centrifugal governor 15 of Fig. 1 is omitted and a suction device

operated by the venturi suction is substituted therefor. The suction caused by the charge flowing through the venturi 60 in the intake passageway varies in direct relation to the speed of the engine. A suction device 61 is connected through conduit 62 with an orifice 23 in the venturi. Suction device 61 is provided with a diaphragm 25 backed up by compression spring 24. A valve 26 is mounted on diaphragm 25 and controls orifice 31 through which conduits 8 and 9 communicate with atmosphere. Since the suction created in the conduit 62 by the fluid flow through the venturi 60 past orifice 23 varies in direct relation to the engine speed, therefore the suction at orifice 23 increases as the speed of the engine increases. Spring 24 is adjusted or formed to have the proper tension to permit diaphragm 25 to overcome it and close valve 26 when the engine reaches a predetermined desired speed. As valve 26 closes, orifice 31 is shut off and suction device 5 is subjected to the suction created at orifices 11 and 12 so that the suction device will start governor valve 2 towards closed position the same as in the form shown in Fig. 1. In other words, the power of the suction at orifice 23 is equivalent to the power of the governor 15 in Fig. 1. Spring 24 is equivalent to and performs the same function as the spring 21 in Fig. 1, and valve 26 is equivalent to and performs the same function as valve 14 of Fig. 1. Aside from the fact that valve 26 is opened and closed by a suction device 61 instead of a centrifugal governor 15, the governor shown in Fig. 3 operates the same as that shown in Fig. 1.

Fig. 4 is a modification using oil pressure to effect the governor valve. The valve 2 is slightly unbalanced, and spring 4 tends to hold the valve open. The pressure device 28 is conventional in form and is provided with the usual flexible diaphragm 72. A rod 74 is fixed at one end to this diaphragm 72 and the other end of the rod contacts the valve arm 3 at 73. If the engine was governed at 2800 R. P. M., the centrifugal governor 15 will hold valve 14 in position shown until the engine reaches 2800 R. P. M. In such position, naturally, the oil pressures taken from the engine oil pump pressure line 27 would be admitted to pressure device 28 through conduit 30, circumferential groove 71 in valve 14 and orifice 29. This oil pressure will act through diaphragm 72, rod 74 and arm 3 to hold valve 2 towards an open position, but when governor 15 is expanded at a predetermined engine speed or the governed speed, valve 14 will move upwardly, closing off orifice 29, and the top of the piston valve 14 will move out of the end of cylinder 13 so that circumferential groove 71 places line 30 in communication with the crankcase or inlet side of the oil pump (not shown) thereby relieving the pressures on the pressure device 28. Spring 4 alone will then be opposing the closing of valve 2, and as valve 2 is slightly unbalanced, the velocity of fluid flow through the intake passageway and vacuum will tend to close it, checking the speed of the engine, but any time the speed of the engine falls slightly, governor 15 will again shift valve 14 and cause communication with the oil pressure line 27 and pressure device 28 which acts through rod 74 and arm 3 to assist spring 4 to open governor valve 2.

I claim:

1. In an internal combustion engine having an intake passageway, a valve for controlling the flow of fluid through said passageway, a suction

operated device connected to said valve, a conduit connecting the suction device into the intake passageway on the engine side of said valve, a second conduit for connecting the suction device with the intake passageway on the atmosphere side of said valve, and valve means controlled in accordance with the speed of the engine for bleeding said conduit to atmosphere whenever the engine falls below a predetermined speed and for closing said conduit to atmosphere whenever the engine reaches a predetermined speed whereby the suction device moves the governor valve towards closed position to maintain the desired governed speed of the engine.

2. In an engine governor having an intake passageway, a governor valve in said passageway, an orifice between the governor valve and the engine, an orifice between the governor valve and the atmosphere, a conduit connecting said orifices, a suction device for controlling said governor valve and connected into the said conduit, a connection between the suction device and the governor valve, whereby the orifice between the governor valve and atmosphere plays the role of an air bleed to the other orifice when the said governor valve moves toward closed position and said orifice between the governor valve and atmosphere ceases to be an air bleed and becomes a suction orifice when the governor valve moves toward open position.

3. The combination as claimed in claim 2 including an outlet to atmosphere for said conduit and valve means controlled in accordance with the speed of the engine for opening said outlet to atmosphere whenever the engine speed falls below a predetermined speed to air bleed the conduit to atmosphere and for closing said outlet to atmosphere whenever the engine reaches a predetermined speed whereby the suction device controls the opening and closing of the governor valve and tends to maintain the desired speed of the engine.

4. The combination as claimed in claim 2 wherein the said conduit is provided with an outlet to atmosphere, a valve for controlling said outlet, and centrifugal means operated in accordance with the speed of the engine for opening said valve when the engine falls below a predetermined speed to bleed said orifices and the suc-

tion device to atmosphere and for closing said valve when the engine speed increases to a predetermined speed whereby the suction device is effective to move said governor valve toward closed position.

5. In an internal combustion engine having an intake passageway, a governor valve for controlling the flow of fluid through said passageway, a suction operated device connected to said governor valve, an orifice in the wall of said intake passageway between the governor valve and the engine, an orifice in the wall of said intake passageway between the governor valve and the atmosphere, a conduit at all times connecting said orifices and communicating through said orifices with the intake passageway, said suction device being connected into said conduit and communicating at all times through said conduit and both of said orifices with said intake passageway whereby the orifice between the governor valve and atmosphere plays the role of an air bleed to the other orifice when said governor valve moves toward closed position and said orifice between said governor valve and atmosphere ceases to be an air bleed and becomes a suction orifice when the governor valve moves toward opened position.

6. In an internal combustion engine having an intake passageway, a governor valve for controlling the flow of fluid through said passageway, a suction operated device connected to said governor valve, an orifice in the wall of said intake passageway between the governor valve and the engine, an orifice in the wall of said intake passageway between the governor valve and the atmosphere, a conduit connecting said orifices together and to said suction operated device so that both orifices create a suction on the suction operated device when the governor valve is at wide open position and the orifice between the governor valve and atmosphere plays the role of an air bleed to the orifice between the governor valve and the engine as the governor valve moves toward a closed position, and a speed controlled device controlled by the speed of the engine to admit atmospheric pressures to said orifices and suction device at predetermined engine speeds.

MARION MALLORY.