EXHAUST AND VACUUM GOVERNOR SYSTEM
Filed Mar. 13, 1961, Ser. No. 95,205
14 Claims. (Cl. 123—183)

This invention relates to a governing mechanism for an internal combustion engine and more particularly to an apparatus for providing an improved override actuation of the primary throttle assembly in a multiple stage carburetor.

In the past, various multiple stage carburetion systems comprised an operator-controlled primary throttle plate assembly with a vacuum controlled governing mechanism and a separate vacuum controlled secondary throttle plate assembly, the secondary throttle plate assembly being operable to supply an additional amount of fuel mixture to the engine upon demand.

Although governors on four-barrel or large carburetors have performed well in most cases, the governors sometimes lack the effectiveness desired when governing is required at or near wide open throttle position. This is due to a lack of effective vacuum necessary to properly actuate the governor diaphragm at the wide open throttle position.

The present invention corrects this problem by adding to the multiple stage carburetion system a device which will complement the vacuum actuating force of the governing unit. This is accomplished by adding a second diaphragm assembly which is actuated by exhaust manifold pressure to provide an additional force which acts with the intake vacuum. It should be understood that this invention is also applicable to large two-barrel carburetors or any carburetor where there is not enough vacuum to start operation of the governor.

It is an object of the present invention to provide in a carburetor having a vacuum operated governor, complementary pressure operated means for assisting in the closing of the throttle plate when the governing speed is attained.

Another object of the present invention is to provide in a governor, multiple stage carburetion system, complementary pressure operated means for assisting in the closing of the primary throttle plates when the governing speed is attained.

Still another object of the present invention is to provide a carburetion system of the type just described where in the complementary pressure operated means is responsive to exhaust manifold pressure.

A further object of the present invention is to provide a governed carburetion system which is simple in construction, economical to manufacture and efficient in operation.

A still further object of the present invention is to provide a pneumatic pressure responsive device for providing an improved override actuation of the primary throttle plates in a multiple stage carburetor.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating preferred embodiments of the invention, wherein:

FIGURE 1 is an elevational view in partial cross section illustrating the invention as it is applied to a four-barrel carburetor having a governor.

FIGURE 2 is a cross-sectional view of the invention taken along the line 2—2 of FIGURE 1.

FIGURE 3 is a cross-sectional view showing another embodiment of the present invention.

FIGURE 4 is a view showing the connections between the operator controlled throttle actuating member and the primary throttle shaft.

Referring to FIGURE 1, a four-barrel carburetor 10 having an air intake 12 is sectioned to expose one of the primary barrels 14 and one of the secondary barrels 16. The primary barrel 14 is provided with a restriction or venturi throat 18 and a conventionally operated throttle plate 20 mounted on the shaft 22 which extends through the other primary barrel, not shown, in which is mounted a throttle plate identical to plate 20. The secondary barrel 16 is also provided with a venturi throat 24 and a throttle plate 26 mounted on the shaft 28 which extends through the other secondary barrel, not shown, in which is mounted another secondary plate.

While a particular four-barrel carburetor is shown for purposes of illustration, it will be apparent from the following description that the invention is equally applicable to two-barrel or other multi-stage carburetors. The invention is further applicable to any carburetor in which the vacuum is too low for proper governing action.

A double diaphragm assembly 30 is mounted on the boss 32 extending from the carburetor throttle body 34. The assembly 30 includes a body 36 formed to provide recesses 38, 40 and 41. The recess 40 is enclosed by means of a flexible diaphragm 42 which is secured to the body 36 by means of a cover member 44 formed to provide an air-tight chamber 46 of which the flexible diaphragm 42 forms a wall. The cover member 44 may be secured to the body 36 by any suitable means such as screws 47.

The recess 41 is enclosed by means of a flexible diaphragm 49 which is secured to the body 36 by means of a cover member 53 formed to provide an air-tight chamber 55 of which the flexible diaphragm 49 forms a wall. The cover member 53 may be secured to the body 36 by fastening means such as screws 47.

As shown in FIGURES 1 and 2, the diaphragms 42 and 49 have secured to the center throttle rods 48 and 51 passing through passages 50 and 57 formed in the body 36. The rods 48 and 51 have laterally extending ends 52 and 61 respectively pivotally secured to the lever arm 54. The lever arm 54 is rigidly secured to the end 56 of the primary throttle shaft 22 which extends into the chamber 38. The shaft 22 is mounted in an anti-friction bearing 39, and a spring 41 is disposed between the bearing 39 and the steel and leather washers 43 and 45 to provide a seal.

A tension spring 58 is attached between the adjustable pin 60, mounted in one of the holes 62 in the body 36, and the lever 54. The spring 58 tends to hold the primary throttle plate 20 in the open position when the usual operator-controlled abutment 69 is removed by depressing the foot throttle pedal. An atmospherically vented cover plate 66 may be secured by screws 68 to housing 36, thereby protecting the mechanism within the chamber 38.

In addition, the cover plate may also be vented to air cleaner pressure as in military applications.

The primary throttle plate 20 is under the joint control of the vehicle operator and the governing system disclosed herein. Means are required to prevent interference between the manual system and the governing system. This includes the structure shown in FIGURE 4 where the throttle shaft 22 is shown as provided with a fixed member 63 having an offset ear 65. A manual operating lever 67 is pivoted to the shaft 22 and includes an offset ear 69 which is adapted to engage against the rear side of the ear 65 as seen in FIGURE 4, so as to prevent counterclockwise rotation of the shaft 22 as viewed in FIGURE 4 or in other words, to prevent opening movement of the throttle plate 20 under influence of the spring 58. The lever 67 has an actuating link 71 connected thereto adapted to be moved in the direction of the arrow upon downward movement of the usual accelerator pedal.
will be understood that this movement of the link 71 causes the ear 69 to tend to move away from the ear 65. However, the tension spring 58 causes corresponding rotation of the throttle shaft 20 and hence, the ear 65 moves with the ear 69 an amount determined by the amount of depression of the accelerator pedal. When the accelerator pedal is released the ear 69 forces the ear 65 to move in a clockwise direction, thus closing the throttle. This movement is under the influence of the usual spring means associated with the accelerator pedal.

If the accelerator pedal is fully or partially depressed and governed speed is reached, the development of the force as will subsequently be described, causes clockwise rotation of the throttle shaft 22 which rotation results in corresponding movement of the throttle plate 20. This movement is permitted since at this time the ear 65 merely moves away from the ear 69 and it is thus only necessary for the diaphragm assembly 30 to overcome the tension of the spring.

The orifice 72 at the primary venturi throat 18 and the orifice 74 below the primary throttle plate 20 are connected by means of the passages 76 and 78, having fixed restrictions 80 and 82 therein respectively, with the passage 86 provided in the body member 36 and the passage 88 provided in the cover member 44. The passage 86 is connected to the chamber 46. A passage 88 intersects passage 84 and terminates in an opening 121 in the body member 36. The opening 121 is adapted to receive the conduit 122.

Chamber 55 is connected to the engine exhaust manifold 90 by means of passage 124 and conduit 128. A restriction 126 is located in conduit 128. In some applications, it may be necessary to provide a bleed between the restriction 126 and the diaphragm.

Located at any desired position on the engine is a governor assembly 92 comprising a stationary housing 94 adapted to be mounted on the engine or remote from the engine and a shaft 96 driven in any suitable manner in proportion to engine or vehicle speed. Mounted for rotation with the shaft 96 is a laterally extending sleeve 98 having a spring 100 mounted within the axial passage 102 in the sleeve 98 by attachment at one end to the internally threaded member 104 which is keyed in passage 102. Spring 100 is adjustable axially of sleeve 98 by turning the adjustment screw 106 which is reached by removing the access screw 108. The other end of the spring 100 is secured to the governor weight 110 movable axially within the chamber 112 against the spring 100 and having at the free end thereof a valve 114 adapted to close the orifice 116 when the weight 100 is forced outwardly due to the rotation of the shaft 96 and the sleeve 98 in accordance with the engine or vehicle speed at which the orifice 116 will be closed is dependent, of course, upon the adjustment of the spring 100. It is apparent that other speed sensing units may be employed.

A vacuum balancing air bleed is provided through the governor assembly 92 to chamber 46 when orifice 116 is uncovered. Conduit 118 between the air intake 42 of the carburetor 10 and the housing 94 and conduit 122 between the housing 94 and the passage 88 in the body 36 are provided so that when the engine or vehicle is operating at a speed insufficient to close the orifice 116, engine vacuum will draw clean air through the conduit 118, into the housing 94, through the orifice 116 and into the chamber 112, through the passage 102 and the axial passage 120 in the shaft 96 and thence through the conduit 122 to the governor diaphragm assembly 30.

The operation of the invention is as follows. With the engine at rest, no engine speed below governing speed, the valve 114 of the governor assembly 92 is open and allows air to bleed into chamber 40, which results in the force of spring 58 overcoming any tendency to close the throttle plates 20. As the predetermined governing speed is reached, the valve 114 is closed by centrifugal force and chamber 46 is evacuated, causing diaphragm 42 to move upwardly. The force created by the manifold exhaust pressure on the diaphragm 49 helps only where the vacuum force is deficient. At part throttle the manifold exhaust pressure decreases, but the intake vacuum builds up enough so that governing is no longer dependent upon the manifold exhaust pressure. Also, at the higher engine speeds the increased exhaust manifold pressure in chamber 55 causes diaphragm 49 to move upwardly. As both diaphragms 42 and 49 move upwardly, lever arm 54 is forced to rotate in a direction which closes the throttle plates 20, thus providing the proper governing action.

In summary, it can be seen that the exhaust manifold pressure fills chamber 55 which forces diaphragm 49 and rod 51 upwardly to assist the intake vacuum operated diaphragm 42 in closing the throttle plates 20. In other words, diaphragm 42 and rod 48 pull to close the throttle plates 20, while the diaphragm 49 and rod 51 push to close the throttle plates 20.

The embodiment shown in FIGURE 3 illustrates a single diaphragm assembly 123 which is used to actuate the primary throttle plates 20 so as to govern the engine.

The assembly comprises a recess 130 which forms chamber 138 when covered by the flexible diaphragm 126. The diaphragm 126 is secured to the body 128 by means of the cover member 134 and screws 135. Cover 134 has a recess 132 which forms chamber 138 when covered by the flexible diaphragm 126. Diaphragm 126 has secured thereon, in the usual manner, rod assembly 139 which includes rod 142 and diaphragm disks 140 and 141. End 144 of the rod 142 is pivotally secured to the arm 146 which has one end 150 fixed to the primary throttle shaft 148. Spring 152 has one end thereof fixed to the other end 154 of the arm 146. The other end of the spring 152 is fixed to the adjustable pin 156 mounted in the body 128. Conduit 164 and passage 166 connect chamber 138 with the exhaust manifold pressure as in the other embodiment. Conduit 158 end passage 160 allow governing vacuum to enter chamber 136 through restriction 162.

In operation, with the engine operating below the predetermined governing speed, the assembly 123 shown in FIGURE 3 is partly inoperative. When the predetermined governing speed is reached, the chamber 136 is evacuated, pulling diaphragm 126 to the left; at the same time, the force of the exhaust pressure has a lever effect on the diaphragm 126 to the left. These forces acting on diaphragm 126 overcome the force of spring 152 and cause lever 146 to move in a clockwise direction closing the throttle plate 165 and thus governing the engine.

The drawings and the foregoing specification constitute a description of the improved exhaust and vacuum govern ing system in such full, clear, exact, and exacting terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A multi-stage carburetor for an internal combustion engine having an exhaust manifold, said carburetor comprising a body 123 includes a body 128 provided with a recess 130 which forms chamber 138 when covered by a flexible diaphragm 126. The diaphragm 126 is secured to the body 128 by means of the cover member 134 and screws 135. Cover 134 has a recess 132 which forms chamber 138 when covered by a flexible diaphragm 126. Diaphragm 126 has secured thereon, in the usual manner, a rod assembly 139 which includes a rod 142 and diaphragm disks 140 and 141. End 144 of the rod 142 is pivotally secured to the arm 146 which has one end 150 fixed to the primary throttle shaft 148. Spring 152 has one end thereof fixed to the other end 154 of the arm 146. The other end of the spring 152 is fixed to an adjustable pin 156 mounted in the body 128. Conduit 164 and passage 166 connect chamber 138 with the exhaust manifold pressure as in the other embodiment. Conduit 158 and passage 160 allow governing vacuum to enter chamber 136 through restriction 162.

2. In operation, with the engine operating below the predetermined governing speed, the assembly 123 shown in FIGURE 3 is partly inoperative. When the predetermined governing speed is reached, the chamber 136 is evacuated, pulling diaphragm 126 to the left; at the same time, the force of the exhaust pressure has a lever effect on the diaphragm 126 to the left. These forces acting on diaphragm 126 overcome the force of spring 152 and cause lever 146 to move in a clockwise direction closing the throttle plate 165 and thus governing the engine.

3. The drawings and the foregoing specification constitute a description of the improved exhaust and vacuum governing system in such full, clear, exact, and exacting terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.
of the engine vacuum on said wall when moving said primary throttle plate towards closed position.

2. The carburetor defined in claim 1 wherein the source of engine vacuum is determined by a speed governor.

3. A multi-stage carburetor for an internal combustion engine having an exhaust manifold, said carburetor comprising a body with primary and secondary induction passages therethrough and having respective primary and secondary throttle plates therein controlling the flow of combustible mixtures to said engine, a venturi formed within said primary induction passage, means for manually controlling the position of said primary throttle plate, vacuum responsive means for controlling the position of said secondary throttle plate, and fluid actuating means operatively connected to said primary throttle plate, said last named means comprising a housing having a lever connected to said primary throttle plate, movable wall means dividing said housing into a pair of chambers, means connecting each of said walls to opposite ends of said lever, first passage means connecting one of said chambers to a source of engine vacuum which is a function of speed and throttle position, and second passage means connecting the other chamber to the exhaust manifold to provide a variable force on said wall means which is effective to complement the force of the engine vacuum on said wall means when moving said throttle plate towards closed position.

4. The carburetor defined in claim 3 wherein said source of engine vacuum is determined by a speed governor.

5. A multi-stage carburetor for an internal combustion engine having an exhaust manifold, said carburetor comprising a body with primary and secondary induction passages therethrough and having respective primary and secondary throttle plates therein controlling the flow of combustible mixtures to said engine, a venturi formed within said primary induction passage, means for manually controlling the position of said primary throttle plate, vacuum responsive means for controlling the position of said secondary throttle plate, and fluid actuating means operatively connected to said primary throttle plate, said last named means comprising a housing having a lever connected to said primary throttle plate, movable wall means dividing said housing into a pair of chambers, means connecting each of said walls to opposite ends of said lever, first passage means connecting one of said chambers to a source of engine vacuum which is a function of speed and throttle position, and second passage means connecting the other chamber to the exhaust manifold to provide a variable force on said wall means which is effective to complement the force of the engine vacuum on said wall means when moving said throttle plate towards closed position.

6. The carburetor defined in claim 5 wherein said source of engine vacuum is in the form of a pair of diaphragms, one diaphragm for each of said chambers.

7. The carburetor defined in claim 5 wherein said wall means is in the form of a diaphragm which separates both of said chambers.

8. A multiple stage carburetor for an internal combustion engine having an exhaust manifold, said carburetor comprising primary and secondary barrels, primary and secondary throttle plates located respectively in said barrels for controlling the flow of combustible mixtures to the engine, means for manually controlling the position of said primary throttle plate, vacuum responsive means for controlling the position of said secondary throttle plate, first fluid responsive actuating means operatively connected to said primary throttle plate to provide a force for controlling the position of said primary throttle plate, and second fluid responsive actuating means operatively connected to said primary throttle plate to provide a variable force which is effective to complement the force of said first actuating means on said primary throttle plate when moving said primary throttle plate towards closed position, said primary actuating means being responsive to an engine vacuum condition and said secondary actuating means being responsive to exhaust manifold pressure.

9. A multiple stage carburetor for an internal combustion engine having an exhaust manifold, said carburetor comprising primary and secondary barrels, primary and secondary throttle plates located respectively in said barrels for controlling the flow of combustible mixtures to the engine, means for manually controlling the position of said primary throttle plate, vacuum responsive means for controlling the position of said secondary throttle plate, first fluid responsive actuating means operatively connected to said primary throttle plate to provide a force for controlling the position of said primary throttle plate, and second fluid responsive actuating means operatively connected to said primary throttle plate to provide a variable force which is effective to complement the force of said first actuating means on said primary throttle plate when moving said primary throttle plate towards closed position, said primary actuating means being responsive to an engine vacuum condition and said secondary actuating means being responsive to exhaust manifold pressure.

References Cited in the file of this patent

UNITED STATES PATENTS

2,343,718 Udale Mar. 7, 1944
2,502,997 Schnaible Apr. 4, 1950
2,527,354 Christian Oct. 24, 1950
2,796,065 Cornelius June 18, 1957
2,876,755 Gold et al. Mar. 10, 1959
2,901,885 Reggio Sept. 1, 1959
2,990,821 Cramer July 4, 1961