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**REMOTE CONTROL MECHANISM FOR PNEUMATIC**  
**AND HYDRAULIC SYSTEMS**

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Dec. 19, 1961

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3,013,777

Filed Sept. 4, 1958

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FIG. 1A.

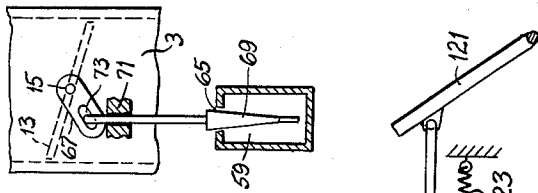
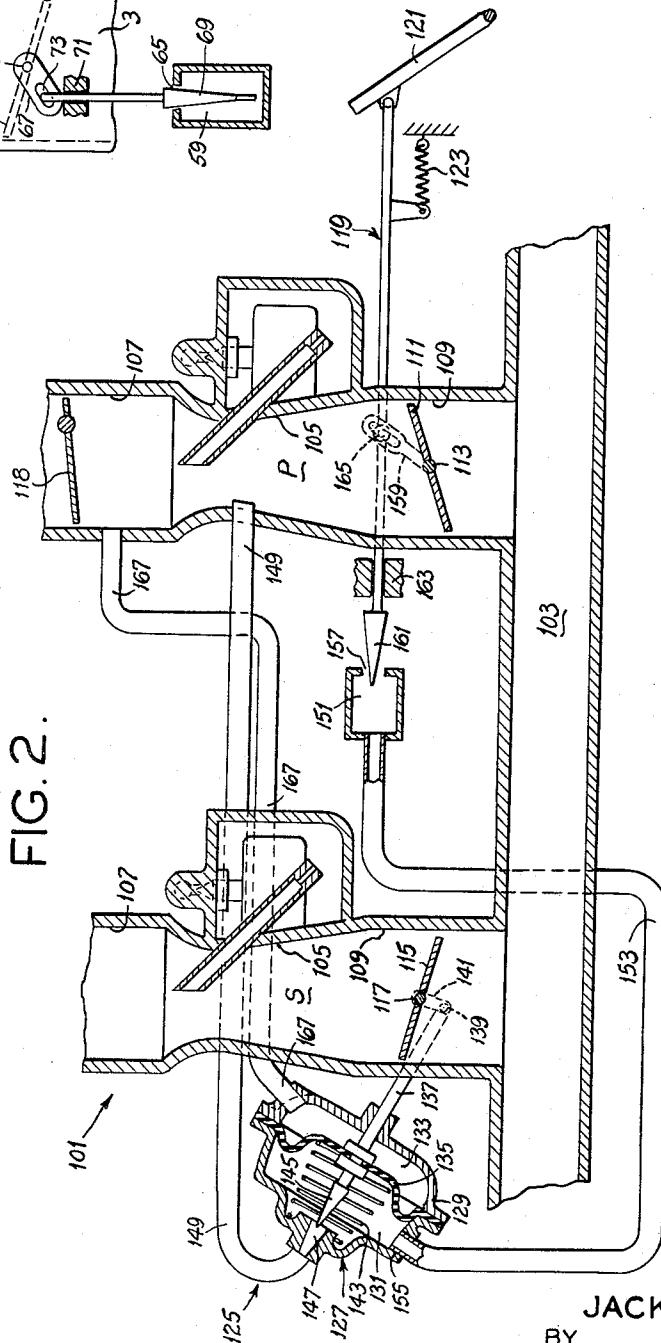


FIG. 2.



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3,013,777

## REMOTE CONTROL MECHANISM FOR PNEUMATIC AND HYDRAULIC SYSTEMS

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Filed Sept. 4, 1958, Ser. No. 758,955

19 Claims. (Cl. 261—23)

This invention relates to remote control systems, especially for carburetors for internal combustion engines of the automotive type, and more particularly to fluid-actuated proportional-position systems of this class.

A certain type of carburetor now in use has a stepped fuel metering rod movable in a metering orifice for metering the flow of fuel to a mixture conduit of the carburetor. Movement of the metering rod is accomplished in some instances by means of a mechanical linkage connecting the rod and the usual throttle valve in the mixture conduit, to change the effective size of the orifice for metering fuel in accordance with throttle valve position, the rate of flow of fuel being increased as the throttle valve is opened in accordance with the stepping of the rod, thereby to provide a relatively lean mixture (the so-called economy mixture) during light load operation and richer mixture during part throttle and wide open throttle operation. With this type of system, positioning of the metering rod may be proportional to positioning of the throttle valve, but the mechanical linkage may be cumbersome particularly in instances where the metering rod is remote from the throttle shaft, and, for a given throttle valve setting, the metering rod remains in the same position though manifold vacuum may vary. In other instances, movement of the metering rod is accomplished by means of a vacuum motor deriving vacuum for its operation from the intake manifold of the engine, but, in prior systems of this type, to approach proportional positioning of the metering rod, there has also been provided a mechanical linkage for relating the position of the metering rod to the position of the throttle valve.

Accordingly, one of the objects of this invention is the provision of a remote control system for operating the metering rod proportionally to the throttle valve, without any mechanical linkage therebetween. Another object, as to this type of system, is the provision of an arrangement in which the positioning of the metering rod is responsive not only to the movement of the throttle valve, but also responsive to variations in manifold vacuum.

Essentially, this object is attained by providing a vacuum-operated servomotor for operating the metering rod, the servomotor being connected to the intake manifold, with a master regulator responsive to movement of the throttle valve for effecting increase or decrease of vacuum in the servomotor for actuating it in one direction or the other, and a follow-up regulator responsive to actuation of the servomotor for effecting decrease of vacuum in the servomotor upon actuation thereof in said one direction to offset an increase in vacuum effected by the master regulator and for effecting increase of vacuum in the servomotor upon actuation thereof in the other direction to offset a decrease effected by the master regulator.

A certain type of multi-stage carburetor now in use has a primary mixture conduit and a secondary mixture conduit with a primary throttle valve in the primary and a secondary throttle valve in the secondary. Another type has two primaries and two secondaries (the so-called four barrel type) with a primary throttle valve for the primaries and a secondary throttle valve for the secondaries. Movement of the secondary throttle valve is accomplished in some instances by means of a mechan-

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ical linkage connecting the primary throttle valve and the secondary throttle valve. With this type of system, positioning of the secondary throttle valve may be proportional to positioning of the primary throttle valve, but the mechanical linkage may be cumbersome. In other instances, movement of the secondary throttle valve may be accomplished by means of a vacuum motor, but with this type of system, the movement of the secondary throttle is not proportional to the movement of the primary throttle.

Accordingly, another object of this invention is the provision of a remote control system for operating a secondary throttle valve proportionally to the primary throttle valve, without any mechanical linkage therebetween.

Another object, as to this type of system, is the provision of an arrangement in which the secondary throttle valve is retained in closed position independently of primary throttle valve position until the engine warms up and the choke valve of the carburetor opens, without any mechanical lock.

The remote control system of this invention is also useful for operating other carburetor elements. For example, it is useful for operating the choke valve of a carburetor in response to movement of the throttle valve during the warm-up period, the system being similar to that used for operating the metering rod, differing primarily therefrom in that the servomotor is connected to actuate the choke valve instead of the metering rod. The system may also be useful in apparatus other than carburetors wherein it is desired to control the movement of one element in response to movement of another. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

FIG. 1 is a diagrammatic view illustrating a metering rod control system of this invention;

FIG. 1A is a vertical section taken on line 1A—1A of Fig. 1;

FIG. 2 is a diagrammatic view illustrating a secondary throttle valve control system of this invention; and,

FIG. 3 is a diagrammatic view illustrating a choke valve control system of this invention.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, FIG. 1 illustrates a fuel supply system comprising a carburetor generally designated 1 having the usual mixture conduit 3 connected to an intake manifold 5 of an internal combustion engine. The mixture conduit has the venturi section 7 above which is the air horn 9 and below which is the usual throttle bore 11. In the throttle bore is the throttle valve 13 on a throttle shaft 15. Fuel is supplied to the mixture conduit through a fuel passage 17 from the float bowl, a portion of which is indicated at 19. Flow through the passage 17 from the bowl is under control of a fuel metering rod 21 which extends through metering orifice 23 in a metering orifice member 25 at the entrance to passage 17. The metering rod 21 is adapted to be moved up and down by a control system 27 of this invention.

System 27 includes a servomotor 29 comprising a cylinder 31 having a partition 33 dividing it into first and second chambers 35 and 37. Partition 33 has a central orifice 39 providing for communication between the chambers. A piston 41 is slidable in the chamber 35, and is biased in the direction away from the partition (upward as illustrated) by a coil compression spring 43

in chamber 35 reacting from the partition. A piston rod 45 extends upward from the piston. Metering rod 21 has its upper end attached to an arm 47 extending laterally from the piston rod. The arrangement is such that when piston 41 moves up, the metering rod moves up, and vice versa. As illustrated, the metering rod is a three-step rod, having an upper so-called economy step 49, a tapered middle step 51, and a lower so-called power step 53, but it will be understood that other step formations may be used. Chamber 37 is connected as indicated at 55 to the intake manifold 5. Extending down from the piston through the orifice 39 in partition 33 is a tapered follow-up regulator valve 57. When piston 41 moves down, valve 57 acts to decrease the effective size of orifice 39, and when piston 41 moves up, valve 57 acts to increase the effective size of orifice 39.

The space in chamber 35 between piston 41 and the partition 33 is in communication with the atmosphere via an air bleed passage 59 shown as provided by a tube 61 extending from adjacent one end of the throttle shaft 15 to a port 63 for chamber 35. Tube 61, at its entrance end adjacent the throttle shaft, has an orifice 65. On the stated end of the throttle shaft is a crank arm 67. A tapered master regulator valve 69 is guided as by means of a guide such as indicated at 71 for vertical movement in the orifice 65. Valve 69, at its upper end, has a pin and slot connection such as indicated at 73 in FIG. 1A with the crank arm 67, the arrangement being such that when the throttle valve is moved in opening direction, valve 69 is moved up and acts to increase the effective size of orifice 65 and when the throttle valve is moved in closing direction, valve 69 is moved down and acts to decrease the effective size of orifice 65.

Operation of the FIG. 1 system is as follows:

Assuming that the engine is in operation and inducing suction in the intake manifold 5, servomotor piston 41 is subjected to downwardly acting force the magnitude of which depends upon the differential in air pressure on the outer end of the piston (its upper end) and the inner end of the piston (its lower end), this force acting in opposition to the upward bias of spring 43. When the pressure differential is relatively low (relative low vacuum in chamber 35), the piston will be raised and the fuel metering pin will be raised, and when the pressure differential is relatively high (relatively high vacuum in chamber 35), the piston will be lowered and the fuel metering pin will be lowered. The vacuum in chamber 35 depends upon the vacuum in the intake manifold, and the position of regulator valves 57 and 69.

Upon movement of the throttle valve 13 in opening direction, master regulator valve 69 is lifted to increase the effective size of orifice 65. This increases the rate of bleeding of air into passage 59 and reduces the vacuum in chamber 35. Piston 41 thereupon rises and lifts the metering rod 21. As the piston 41 rises, it lifts the follow-up regulator valve 57 thereby increasing the effective size of orifice 39. This has the effect of increasing the vacuum in chamber 35 by increasing the rate of flow from chamber 35 to the manifold. Accordingly, piston 41 rises to the point where the decrease in vacuum caused by lifting the master regulator valve 69 is offset by the increase in vacuum caused by lifting the follow-up regulator valve 57, and then it stops. The travel of the piston 41 is proportional to the travel of the master regulator valve 69, as determined by the contour of the valves 57 and 69, hence proportional to the travel of the throttle valve. Metering rod 21 is lifted by the piston and its travel (which is the same as that of the piston) is proportional to the travel of the throttle valve.

Upon movement of the throttle valve 13 in closing direction, master valve 69 is lowered to decrease the effective size of orifice 65. This decreases the rate of bleeding of air into passage 59 and increases the vacuum in chamber 35. Piston 41 thereupon lowers, and lowers the metering rod 21. As the piston lowers, it lowers valve 57 thereby decreasing the size of orifice 39. This has

the effect of decreasing the vacuum in chamber 35 by decreasing the rate of flow from chamber 35 to the manifold. Accordingly, piston 41 lowers to the point where the increase in vacuum in chamber 35 caused by lowering valve 69 is offset by the decrease in vacuum caused by lowering the valve 57, and then it stops. The travel of the piston is proportional to the travel of the throttle valve. Metering rod 21 is lowered by the piston and its travel is proportional to the travel of the throttle valve.

Assuming that the vacuum in the intake manifold changes without movement of the throttle valve (as on a change in load on the engine), piston 41 is moved up or down, dependent upon whether the manifold vacuum decreases or increases. When the piston moves up in response to decreased manifold vacuum, it moves follow-up regulator valve 57 upward, which has the effect of increasing the vacuum in chamber 35, and the piston moves up to the point where the increase offsets the decrease. When the piston moves down in response to increased manifold vacuum, it moves valve 57 down, which has the effect of decreasing the vacuum in chamber 35, and the piston moves down to the point where the decrease offsets the increase.

From the above, it will be observed that the positioning of piston 41 and hence the positioning of fuel metering rod is responsive to the movement of the throttle valve and variations in manifold vacuum such as may occur without movement of the throttle valve. The metering rod follows up the action of the throttle valve, its movement corresponding in both direction and magnitude to the movement of the throttle valve. It will be understood that with the throttle in its dead idle position, the metering rod will be at the lower limit of its travel. Then, as the throttle valve is opened, with resulting lifting of master regulator valve 69, the metering rod will be raised in amount proportional to the degree of opening of the throttle valve. Raising the metering rod varies the position of the lower end portion of the rod in orifice 23, with resultant variation in the effective size of orifice 23 and resultant variation of the supply of fuel to mixture conduit 3. The control is particularly effective in the part throttle range wherein tapered step 51 of the metering rod provides close control of the mixture.

FIG. 2 illustrates a fuel supply system comprising a multi-stage carburetor 101 having a primary mixture conduit P and a secondary mixture conduit S connected to intake manifold 103 of an internal combustion engine. Each mixture conduit has the usual venturi section 105 above which is the air horn portion 107 and below which is the throttle bore 109. In the throttle bore of conduit P is the primary throttle valve 111 on primary throttle shaft 113, and in the throttle bore of conduit S is the secondary throttle valve 115 on secondary throttle shaft 117. Each mixture conduit has the fuel supply system which, being well known in the art, is illustrated. In the air horn of the primary mixture conduit is the choke valve 118.

The linkage for operating the primary throttle valve 111 is indicated at 119. This includes pedal 121 and return spring 123. The secondary throttle valve 115 is controlled by a control system 125 of this invention. System 125 includes a servomotor 127, shown as being a diaphragm type of motor, comprising a case 129 divided into a first chamber 131 and a second chamber 133 by a diaphragm 135. A rod 137 extends from the diaphragm to a connection at 139 with an arm 141 on one end of secondary throttle shaft 117. A spring 143 in chamber 131 biases the diaphragm and rod in the direction for closing the secondary throttle valve 115. A tapered follow-up regulator valve 145 is movable with the diaphragm, extending from the latter within chamber 131 and through an orifice 147 in the case 129. Orifice 147 provides for communication between chamber 131 and a passage 149 which is connected into the venturi section 105 of primary mixture conduit P for in-

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ducing a vacuum in chamber 131. Passage 149 is shown as being provided by a tube, but it will be understood that as a matter of practice it may be provided by a suitable passageway directly in the carburetor body. When diaphragm 135 moves toward the left as illustrated in FIG. 2 in secondary throttle valve opening direction, valve 145 acts to decrease the effective size of orifice 147, and when the diaphragm moves toward the right, valve 145 acts to increase the effective size of orifice 147.

Chamber 131 is in communication with the atmosphere via an air bleed passage 151 shown as provided by a tube 153 extending from adjacent one end of the primary throttle shaft 113 to a port 155 for chamber 35. Tube 153, at its entrance end adjacent the primary throttle shaft, has an orifice 157. On the stated end of the primary throttle shaft is a crank arm 159. A tapered master regulator valve 161 is guided as by means of a guide such as indicated at 163 for movement in the orifice 157. Valve 161 has a pin and slot connection such as indicated at 165 with the crank arm 159, the arrangement being such that when the primary throttle valve 111 is moved in opening direction (which is counterclockwise as viewed in FIG. 2), valve 161 is moved toward the left as shown and acts to decrease the effective size of orifice 157 and when the primary throttle valve is moved in closing direction, valve 161 is moved toward the right and acts to increase the effective size of orifice 157. Chamber 133 of servomotor 127 is connected to the primary mixture conduit P posterior to choke valve 118 by a line 167.

Operation of the FIG. 2 system is as follows:

Assuming that the engine is in operation, and drawing vacuum in the manifold 103, servomotor diaphragm 135 is biased toward the right in secondary throttle closing direction by spring 143 and is adapted to be biased in secondary throttle opening direction by higher pressure in chamber 133 than in chamber 131. When choke valve 118 is closed, suction in air horn 107 of primary mixture conduit P posterior to the choke valve induces a vacuum in chamber 133 via line 167. This vacuum offsets any vacuum induced in chamber 131, and spring 143 holds the secondary throttle valve 115 in closed position.

When the choke valve 118 is opened, pressure in chamber 133 rises to atmospheric pressure. Upon movement of the primary throttle valve 111 in opening direction, master regulator valve 161 is moved toward the left as viewed in FIG. 2 to decrease the effective size of orifice 157. This has the effect of increasing the vacuum drawn in chamber 131 via passage 149 by decreasing the air bleed. Accordingly, diaphragm 135 moves to the left against the bias of spring 143 to move the secondary throttle valve 115 in opening direction. As diaphragm 135 moves to the left, the follow-up regulator valve 145 moves to the left to decrease the effective size of orifice 147. This has the effect of decreasing the vacuum in chamber 131. Accordingly, diaphragm 135 moves to the point where the decrease in vacuum caused by moving the follow-up valve 145 offsets the increase in vacuum caused by moving the master valve 161, and then it stops. The travel of the diaphragm 135 is proportional to the travel of master valve 161, hence the travel of the secondary throttle valve 115 is proportional to the travel of the primary throttle valve 111. The proportion may be made whatever may be desired by suitably contouring the valves 145 and 161. For example, the valves may be contoured so that the secondary throttle valve does not open until the primary throttle valve is half open, and from then on the secondary throttle valve opens at a rate such that it reaches fully open position when the primary throttle valve reaches fully open position.

Upon movement of the primary throttle valve 111 in closing direction (clockwise as viewed in FIG. 2), master regulator valve 161 is moved toward the right to increase the effective size of orifice 157. This has the

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effect of decreasing the vacuum drawn in chamber 131 via passage 149 by increasing the air bleed. Accordingly, diaphragm 135 moves to the right under the bias of spring 143 to move the secondary throttle valve 115 in closing direction. As diaphragm 135 moves to the right, the follow-up regulator valve 145 moves to the right to increase the effective size of orifice 147. This has the effect of increasing the vacuum in chamber 131. Accordingly, diaphragm 135 moves to the point where the increase in vacuum caused by moving the follow-up valve 145 offsets the decrease in vacuum caused by moving the master valve 161, and then it stops. Again, the travel of the diaphragm is proportional to the travel of the master valve, hence the travel of the secondary throttle valve is proportional to the travel of the primary throttle valve.

It will be understood that vacuum may be induced in chamber 131 other than by connection to the venturi section of the primary mixture conduit. For example, it may be induced by connection to a vacuum booster pump such as is frequently provided in a vehicle, or by connection directly to the intake manifold.

FIG. 3 illustrates a fuel supply system comprising a carburetor which may be the same as that shown in FIG. 1, and which accordingly is designated 1, and the parts of which are designated by the same reference characters as in FIG. 1. In the air horn 9 of the carburetor is the usual choke valve 171 on choke valve shaft 173. The choke valve is adapted to be moved between its closed and open positions by a control system 175 of this invention.

System 175 includes a housing 177 containing a thermostatic coil 179. The center of the coil is anchored as indicated at 181. Housing 177 is formed to provide a servomotor cylinder 183. This cylinder (like cylinder 31 of FIG. 1) has a partition 185 dividing it into first and second chambers 187 and 189. Partition 185 has a central orifice 191 providing for communication between the chambers. A piston 193 is slidable in chamber 187. A rod 195 extends from the end of the piston away from the partition out of the housing 177 to a connection at 197 with an arm 199 on one end of the choke valve shaft. The outer end of thermostatic coil 179 engages a finger 201 on rod 195; and coil 179 acts to bias the rod toward the left as viewed in FIG. 3 in the direction to close the choke valve. The arrangement is such that when the piston 193 moves to the right from its FIG. 3 position, the choke valve is opened. Extending to the right from the piston through the orifice 191 in the partition is a tapered follow-up regulator valve 203 (like valve 57 of FIG. 1). When piston 193 moves to the right, valve 203 acts to decrease the effective size of orifice 191, and when the piston is moved to the left, valve 203 acts to increase the effective size of the orifice.

At 205 is indicated an inlet to housing 177 for hot air from the usual exhaust manifold stove (not shown). The space in chamber 187 between piston 193 and the partition 185 is in communication with the atmosphere via an air bleed passage 207 (corresponding to passage 59 of FIG. 1) shown as provided by a tube 209 extending from adjacent one end of the throttle shaft 15 to a port 211 for chamber 187. Tube 209, at its entrance end adjacent the throttle shaft, has an orifice 213. On the stated end of the throttle shaft is a crank arm 215. A tapered master regulator valve 217 is operable by the crank arm 215, the arrangement being such that when the throttle valve is moved in opening direction, valve 217 is moved down and acts to decrease the effective size of orifice 213, and when the throttle valve is moved in closing direction, valve 217 is moved up and acts to increase the effective size of orifice 213 (the reverse of the action of valve 69 of the FIG. 1 system). Chamber 189 is connected to the intake manifold by a tube 219.

Operation of the FIG. 3 system is as follows:

Upon movement of the throttle valve 13 in opening direction, master regulator valve 217 is lowered to decrease the effective size of orifice 213. This tends to increase the vacuum in chamber 187 by reducing the air bleed. Piston 193 thereupon moves toward the right to move the choke valve 171 in opening direction. As the piston 193 moves to the right, it moves the follow-up regulator valve 203 to the right thereby decreasing the effective size of orifice 191. This has the effect of decreasing the vacuum in chamber 187. Accordingly, piston 193 moves toward the right to the point where the increase in vacuum caused by lowering the master regulator valve 217 is offset by the decrease in vacuum caused by moving the follow-up regulator valve 203, and then it stops. The travel of the piston 193 is proportional to the travel of the master regulator valve 217, as determined by the contour of the valves 203 and 217, hence proportional to the travel of the throttle valve. Choke valve 171 is moved in opening direction by the piston and its travel (which is determined by the movement of the piston) is proportional to the travel of the throttle valve.

Upon movement of the throttle valve 13 in closing direction, valve 217 is raised to increase the effective size of orifice 213. This decreases the vacuum in chamber 187 by increasing the air bleed. Piston 193 thereupon moves to the left to move the choke valve 171 in closing direction. As the piston moves to the left, it moves valve 203 to the left, thereby increasing the size of orifice 191. This has the effect of increasing the vacuum in chamber 187. Accordingly, piston 193 moves to the left to the point where the decrease in vacuum caused by raising valve 217 is offset by the increase in vacuum caused by moving the valve 203, and then it stops. The travel of the piston is proportional to the travel of the throttle valve. Choke valve 171 is moved in closing direction by the piston and its travel is proportional to the travel of the throttle valve.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a carburetor for an internal combustion engine, a mixture control element, a vacuum-operated servomotor for actuating said mixture control element, means for connecting the servomotor to a source of engine-induced suction for providing a vacuum in the servomotor for operating it, a master regulator having a connection with said servomotor for effecting increase or decrease of vacuum in the servomotor for actuating it in one direction or the other, and a follow-up regulator connected with said servomotor for actuation thereby for effecting decrease of vacuum in the servomotor upon actuation thereof in said one direction to offset an increase in vacuum effected by said master regulator and for effecting increase of vacuum in the servomotor upon actuation thereof in said other direction to offset a decrease in vacuum effected by said master regulator.

2. In a carburetor as set forth in claim 1, the carburetor having a throttle valve, and said master regulator being responsive to movement of the throttle valve.

3. In a carburetor as set forth in claim 1, said mixture control element being a fuel metering rod, the carburetor having a throttle valve, and said master regulator being responsive to movement of the throttle valve.

4. In a carburetor as set forth in claim 1, said carburetor having a primary mixture conduit with a primary throttle valve therein, and a secondary mixture conduit with a secondary throttle valve therein, said mixture

control element being the secondary throttle valve, said master regulator being responsive to movement of the primary throttle valve.

5. In a carburetor as set forth in claim 1, the carburetor having a mixture conduit with a choke valve and a throttle valve therein, said mixture control element being the choke valve, said master regulator being responsive to movement of the throttle valve.

6. In a carburetor for an internal combustion engine, said carburetor having a mixture conduit, a throttle valve in said mixture conduit, a mixture control means comprising a fuel metering rod, a passage for flow of air from the atmosphere to a source of engine-induced suction, means for varying the rate of flow of air from said passage to said source including a servomotor responsive to variations of air pressure in said passage and a valve controlled by said servomotor, means for actuating said fuel metering rod from said servomotor, and valve means connected to said throttle valve and operated by movement thereof for varying the rate of flow of air from the atmosphere into said passage.

7. In a carburetor as set forth in claim 6, said servomotor being responsive to differential pressure of air in said passage and atmospheric air pressure.

8. In a carburetor for an internal combustion engine, said engine having an intake manifold, said carburetor having a mixture conduit for connection to said manifold, a throttle valve in said mixture conduit, and a mixture control means, means for actuating the mixture control means comprising a servomotor having a chamber and a movable element closing the chamber, means for connecting the chamber to a source of engine-induced suction for inducing a vacuum in said chamber on one side of said element, said connecting means including means responsive to movement of said element for regulating the vacuum in said chamber adapted to decrease the vacuum on movement of said element in one direction and to increase the vacuum on movement of said element in the opposite direction, an atmospheric air bleed for said chamber, and a regulator connected to the throttle valve and operated thereby for regulating the bleeding of air from the atmosphere through said bleed into said chamber.

9. In a carburetor as set forth in claim 8, the other side of said element being subjected to atmospheric pressure and said element thereby being responsive to differential pressure of air in said chamber and atmospheric pressure.

10. In a carburetor as set forth in claim 8, said mixture control means being a fuel metering rod.

11. In a carburetor as set forth in claim 8, said mixture conduit being a primary mixture conduit, said throttle valve being a primary throttle valve, said carburetor having a secondary mixture conduit and a secondary throttle valve therein, and said mixture control element being the secondary throttle valve.

12. In a carburetor as set forth in claim 8, said mixture control means being a choke valve in the mixture conduit.

13. In a carburetor for an internal combustion engine, said engine having an intake manifold, said carburetor having a mixture conduit, a throttle valve in said mixture conduit, and a mixture control means, means for actuating the mixture control means comprising a servomotor having a chamber and a movable element closing the chamber, means providing an orifice for connecting the chamber to the intake manifold for inducing a vacuum in said chamber on one side of said element, the other side of said element being subjected to atmospheric pressure and adapted to be biased in one direction thereby, spring means biasing said element in the opposite direction, a regulating valve carried by and responsive to movement of said element and extending through said orifice for regulating the vacuum in said chamber adapted to decrease the vacuum on movement of said

element in said one direction and to increase the vacuum on movement of said element in the opposite direction, an atmospheric air bleed for said chamber, and a regulating valve operably connected with the throttle valve for regulating the bleeding of air from the atmospheric through said bleed into said chamber.

14. In a carburetor as set forth in claim 13, said mixture control means being a fuel metering rod.

15. In a carburetor as set forth in claim 13, said mixture control means being a choke valve in the mixture conduit.

16. In a carburetor as set forth in claim 15, said spring means being a thermostatic spring means.

17. In a carburetor for an internal combustion engine, said carburetor having a primary mixture conduit, a primary throttle valve in the primary mixture conduit, a secondary mixture conduit, and a secondary throttle valve in the secondary mixture conduit, means for actuating the secondary throttle valve comprising a servomotor having a chamber and a movable element closing the chamber, means providing an orifice for connecting the chamber to a source of engine-induced suction for inducing a vacuum in said chamber on one side of said element, said element being adapted to be biased in one direction by air pressure on its other side, spring means biasing said element in the opposite direction, a regulating valve carried by and responsive to movement of said element and extending through said orifice for regulat-

ing the vacuum in said chamber adapted to decrease the vacuum on movement of said element in said one direction and to increase the vacuum on movement of said element in the opposite direction, an atmospheric air bleed for said chamber, and a regulating valve operably connected with the primary throttle valve for regulating the bleeding of air from the atmosphere through said bleed into said chamber.

18. In a carburetor as set forth in claim 17, said primary mixture conduit having a venturi section and said means for inducing vacuum in said chamber providing a connection to said venturi section.

19. In a carburetor as set forth in claim 17, said servomotor having a second chamber on said other side of its said movable element, said primary mixture conduit having a choke valve therein, and means for connecting said second chamber to said primary mixture conduit posterior to the choke valve.

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