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PRESSURE RESPONSIVE VALVE

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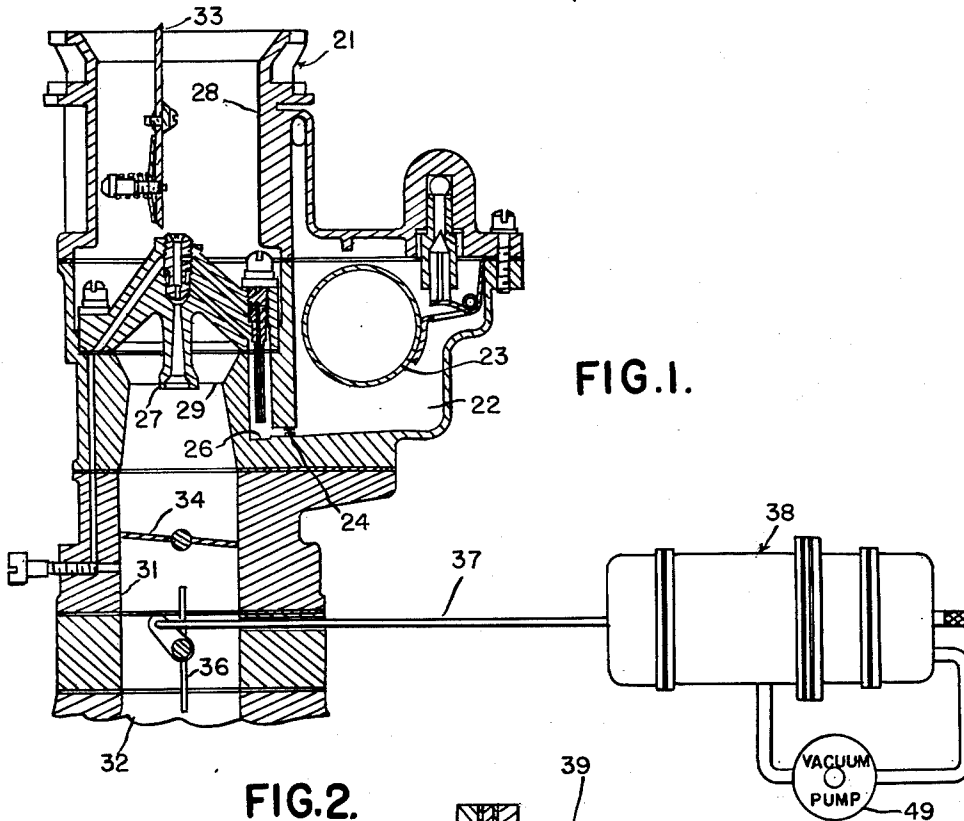


FIG. 1.

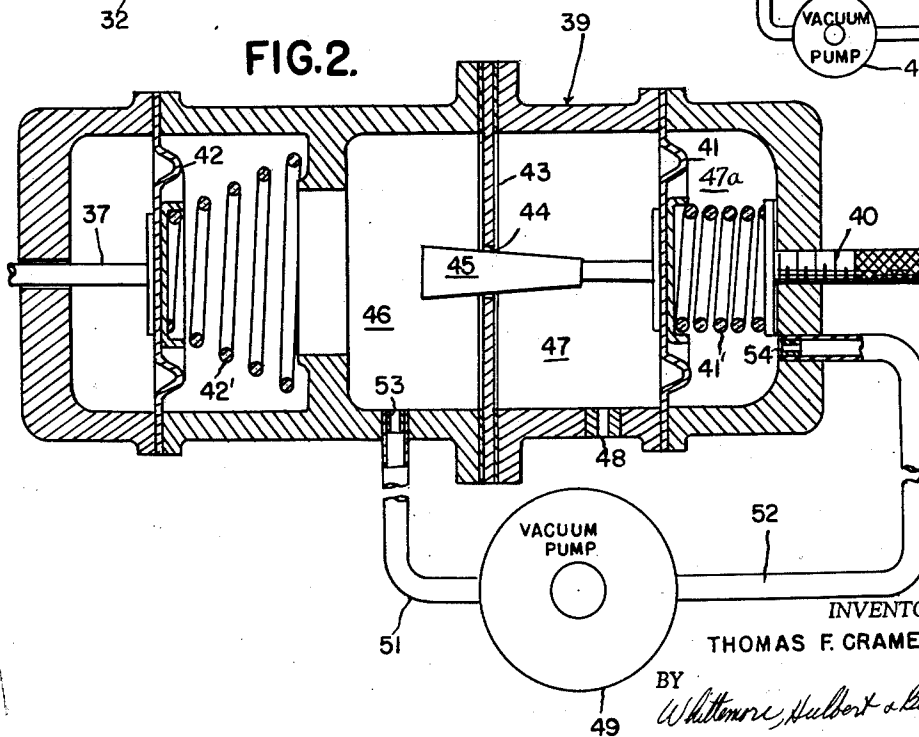


FIG. 2.

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PRESSURE RESPONSIVE VALVE

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4 Claims. (Cl. 123-103)

This invention pertains to a fluid pressure responsive valve for modifying a pressure range between a pressure source and work chamber. More specifically this invention provides a valve for use in an internal combustion engine governing system which modifies a governing vacuum to produce a desired speed-vacuum relation to actuate the governing mechanism.

It is desirable in internal combustion engine governing systems to have a governor actuating vacuum source that is effective at the governed speed to provide a controlled closing movement of a throttle member. This invention provides a valve for converting a speed responsive vacuum to the desired closing movement.

The valve has a work chamber or throttle actuating diaphragm and a control diaphragm which are subject to and spring urged against a speed responsive vacuum which in the embodiment described below is from an engine or drive shaft driven vacuum pump. The throttle actuating diaphragm is connected to atmospheric pressure through an opening controlled by a cone member attached to the control diaphragm and at a predetermined pump vacuum, the control diaphragm is moved against the spring pressure to gradually close the opening until the throttle actuating diaphragm is subject to substantially unmodified pump vacuum and controls the governed throttle accordingly.

It is therefore an object of this invention to provide a vacuum responsive valve which connects a vacuum source to a pressure port until a predetermined vacuum is reached.

It is a further object of this invention to provide a valve having a pair of diaphragms both of which are subject to source vacuum and one of which is subject to a pressure port through an opening controlled by the second diaphragm with means for progressively closing off such an opening as the source vacuum increases.

It is another object to provide actuating means for an automobile engine governor which connects a governor actuating vacuum to atmospheric pressure until a predetermined vacuum is reached, at which time the connection to atmosphere is reduced.

These and other objects will become more apparent when a preferred embodiment of this invention is considered in connection with the drawings, in which:

FIGURE 1 is a partially sectioned schematic view of a conventional air intake and fuel system as modified by a governing throttle actuated by the valve of this invention; and

FIGURE 2 is an enlarged sectioned view of a valve of this invention.

Shown in FIG. 1 is housing 21 and formed therein is fuel bowl 22 and a float 23 which maintains a fuel level therein in a conventional manner. Fuel is drawn from bowl 22 through metering orifice 24 to well 26 where it is subject to the vacuum of venturi 27. Also formed in housing 21 are air intake 28, throat 29 and fuel mixture passage 31 which leads to the intake manifold 32. Choke 33 is mounted and operates in a conventional manner in intake 28, and throttle 34 and governing throttle 36 are mounted to pivot in passage 31 and control flow there-through. Governing throttle 36 is pivotable through horizontal movement of arm 37 which is slidable through an opening in the wall of the housing 21 and which is con-

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nected to the actuating diaphragm 42 in valve 38 now to be described.

Valve 38 has a housing 39 which has fitted therein control diaphragm 41, actuating diaphragm 42 having rod 37 fixed thereto, and wall 43, which has formed centrally therein opening 44. Attached to and movable by diaphragm 41 and inserted through opening 44 is cone 45 which is movable rightwardly to reduce the air passage through the opening 44. Threadedly mounted in the right end of housing 39 is spring adjuster 40 and slidably mounted in the left end of housing 39 is actuating rod 37. Springs 41' and 42' are operable to leftwardly urge diaphragms 41, 42 respectively.

Between diaphragm 42 and wall 43 is work chamber 46 and between wall 43 and diaphragm 41 is pressure chamber 47. To the right of diaphragm 41 is control chamber 47a. Formed in housing 39 is metering pressure port 48 which connects chamber 47 to atmosphere. Vacuum pump 49 is connected to the engine distributor shaft and produces a vacuum proportional to engine speed. Of course pump 49 could measure vehicle speed and be connected to the vehicle drive shaft or be otherwise speed responsive as desired. Lines 51, 52 are subject to the vacuum and enter respectively through restrictions 53, 54 into work chamber 46 and the control chamber for diaphragm 41.

It is the operation of this embodiment to utilize vacuum from pump 49 to actuate diaphragm 42 and move governor rod 37 to close governor throttle 36 when a predetermined engine speed has been reached. The vacuum from pump 49 is not effective to move diaphragm 42 against spring 42' during low engine speeds since chamber 46 is subject to atmospheric pressure from port 48 through the clearance between cone 45 and opening 44 in wall 43. However, as the engine speed increases, the vacuum moves control diaphragm 41 rightwardly against spring 41' moving cone 45 rightwardly to progressively close the opening 44 thereby gradually decreasing the atmospheric air flow into chamber 46 so that diaphragm 42 becomes subject to an increasing percentage of the vacuum. When diaphragm 41 has been drawn to its rightwardmost position, air passage through opening 44 is reduced to a minimum and pump vacuum in chamber 46 actuates diaphragm 42 and governor throttle 36.

The vacuum at which diaphragm 42 begins to move may be adjusted by turning screw 40 which adjusts the compression of spring 41'. The surface configuration of cone 45 determines the rate at which the air passage through opening 44 is reduced for a given axial movement of the cone and may be proportioned as desired to control the rate with which diaphragm 42 moves. Also spring 42' and orifices 48, 53 and 54 may be proportioned as desired to obtain the desired governing characteristics. Port 44 and valve member 45 constitute a variable atmospheric bleed valve for controlling vacuum in chamber 46, and the chamber 46 is thus subjected to a variable vacuum which may equal the vacuum developed by pump 49 when valve member 45 is closed. Chamber 47a is completely independent of chamber 46 and has only the single external connection afforded by passage 52 so that chamber 47a is at all times subjected to the vacuum developed by pump 49.

This invention could be applied equally well to govern the throttle 34 through a lost motion or other connection and to govern in single or multiple stage carburetors.

The drawing and the foregoing specification constitute a description of the improved engine governing system in such full, clear, concise and exact 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 governor system comprising a movable speed con-

trol member, a speed responsive vacuum pump for developing a vacuum in proportion to the speed to be governed, a unitary device comprising a housing, a substantially rigid barrier extending transversely across the interior of said housing, a valve port extending through said rigid barrier, a first movable wall in said housing spaced substantially from said barrier and defining with a portion of said housing and with one side of said rigid barrier an expansible work chamber, means connecting said first movable wall to said speed control member, first resilient means operatively connected to said first movable wall for biasing said first movable wall in a direction to close said speed control member, a second movable wall in said housing on the other side of said rigid barrier and spaced substantially from said barrier, said second movable wall dividing said housing on said other side of said barrier into an expansible valve chamber and an expansible control chamber, said valve chamber being located adjacent to said rigid barrier and in fluid communication with said work chamber through said valve port, a restricted passage in the wall of said housing connecting said valve chamber to atmosphere, a tapered valve in said valve port, means connecting said tapered valve to said second movable wall for controlling the rate of fluid communication between said work and valve chambers, said valve when opened permitting the vacuum in said work chamber to modify the atmospheric pressure in said valve chamber to provide a modified sub-atmospheric pressure which acts on one side of said second movable wall, second resilient means operatively connected to said second movable wall for biasing said second movable wall and valve in a direction to open said valve port, a first passage connecting said vacuum pump to said work chamber, and a second passage completely independent of said first passage connecting said vacuum pump to said control chamber whereby the vacuum acts on the other side of said second movable wall, each of said passages having a restriction provided therein.

2. The structure defined in claim 1 wherein said first and second movable walls are in the form of flexible diaphragms.

3. The structure defined in claim 1 wherein said first and second resilient means are in the form of springs.

4. A governor system comprising a movable speed control member, a speed responsive vacuum pump for de-

veloping a vacuum in proportion to the speed to be governed, a device comprising a housing, a substantially rigid barrier extending transversely across the interior of said housing, a first movable wall in said housing spaced substantially from said barrier and defining with a portion of said housing and with one side of said rigid barrier an expansible work chamber, means connecting said first movable wall to said speed control member, first resilient means operatively connected to said first movable wall for biasing said first movable wall in a direction to close said speed control member, a second movable wall in said housing on the other side of said rigid barrier and spaced substantially from said barrier, said second movable wall dividing said housing on said other side of said barrier into an expansible valve chamber and an expansible control chamber, said valve chamber being located adjacent to said rigid barrier, a passage including a valve port connecting said work chamber to said valve chamber, a restricted passage in the wall of said housing connecting said valve chamber to atmosphere, a regulating valve co-operating with said valve port, means connecting said valve to said second movable wall for controlling the rate of fluid communication between said work and valve chambers, said valve when opened permitting the vacuum in said work chamber to modify the pressure in said valve chamber to provide a modified sub-atmospheric pressure which acts on one side of said second movable wall, second resilient means operatively connected to said second movable wall for biasing said second movable wall and valve in a direction to open said valve port, a first passage connecting said vacuum pump to said work chamber, and a second passage connecting said vacuum pump to said control chamber whereby the vacuum acts on the other side of said second movable wall in opposition to the sub-atmospheric pressure in said valve chamber, each of said passages having a restriction provided thereto.

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