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1,584,931

R. G. HANDY ET AL

GOVERNOR

Filed May 8, 1922

Fig. 1.

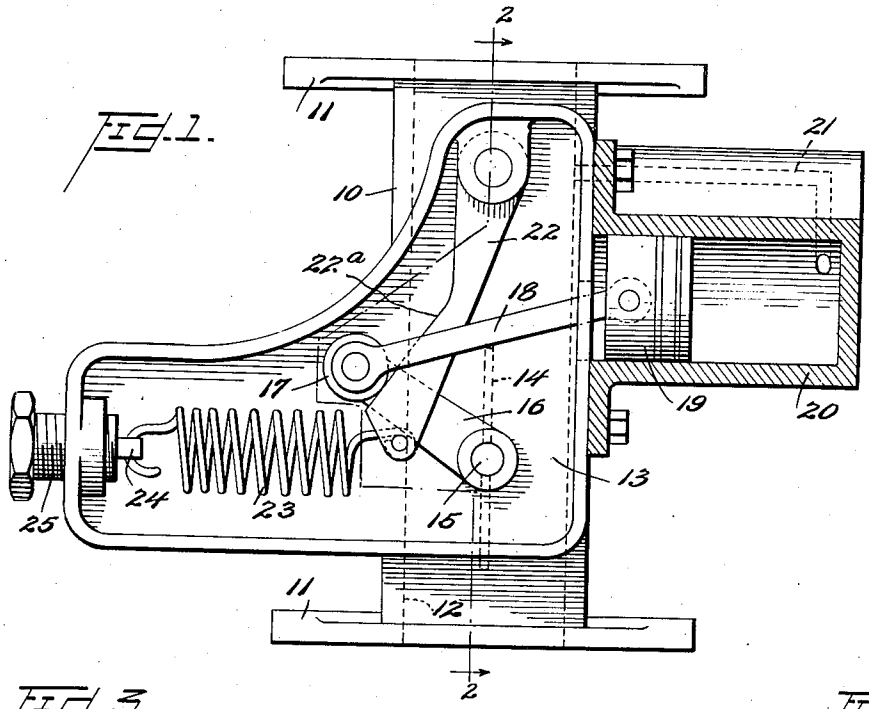


Fig. 3.

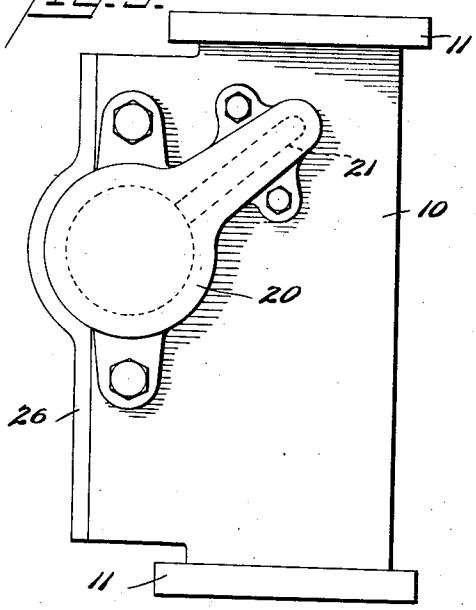
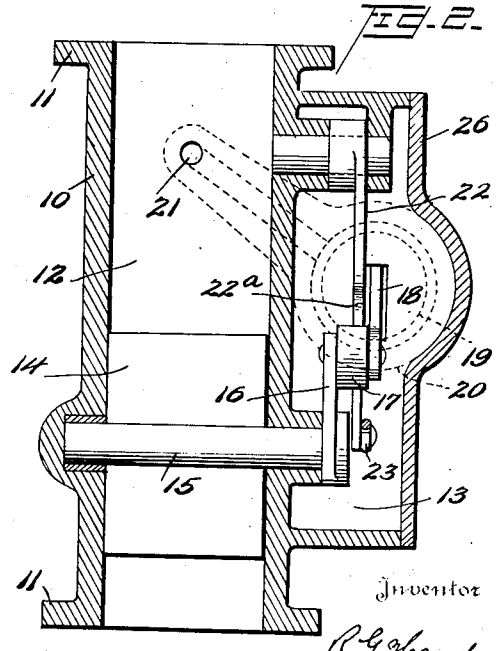


Fig. 2.



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UNITED STATES PATENT OFFICE.

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GOVERNOR.

Application filed May 8, 1922. Serial No. 559,434.

The present invention relates to governors; more particularly for hydrocarbon motors and of the type actuated by suction in the intake of the motor, being a species of the invention described and claimed in application Serial No. 383,259.

If the intake of a hydrocarbon motor is obstructed, it is found that the vacuum therein on the cylinder side of the obstruction increases very rapidly as the obstruction becomes more complete; that is to say, the vacuum increases at an accelerated rate as distinguished from a uniform or regular rate, when the motor is operating at a constant speed. As is well known, a spring or similar yielding device offers a gradually increasing resistance as it is deformed. Hence governors of the type mentioned, which employ a throttle valve actuated, or controlled, by vacuum in the intake conduit, cannot be directly balanced by a spring at all positions of the valve, when the engine is operating at a constant speed. The spring may balance the governor at one or at two positions of the valve, but will not balance the same at any other points. In order therefore that the governor may maintain a predetermined engine speed under varying loads and valve positions, it is necessary to introduce a correcting means between the suction actuated motive device and the counterbalancing spring.

A suction controlled governor can be embodied in several different forms. In its simplest form the governor may consist of an unbalanced valve pivoted in the intake conduit and counterbalanced by a spring through the medium of a corrective mechanism. A governor of this description is disclosed in application No. 383,259 referred to above. In the governor described in said prior application, the valve operates both as a throttle means and as the suction responsive element. In this form the elements of the governor have been reduced and consolidated into the fewest possible number of parts and represents probably the highest development of the suction actuated governor. However, it is desirable, in some cases, to use a balanced throttle valve, or a throttle valve which does not depend upon the suction effect directly on it to actuate it, and in such cases it is necessary to employ a separate suction actuated motive element for operating the valve. A governor which employs a throttle valve and a separate suction responsive member for operating the valve may take either of two forms, as follows:

1. The suction responsive member may be directly connected with the valve so that the ratio of movement of the valve to the movement of the member is substantially constant, in which case the counterbalancing force may act on any part of the governor through the medium of a corrective mechanism.

2. The suction responsive member may be opposed by a spring or other yielding force and said member connected with the valve through a corrective mechanism which will correlate the movements of the member and valve to give the desired governor action.

The second of the types just mentioned is described and claimed in our copending application No. 559,435.

The present invention has to do with the first type. It comprises a throttle valve in the intake passage, a suction responsive member connected to the intake passage at a point between the valve and the intake manifold, means connecting the suction responsive member and the throttle valve to operate the latter in accordance with movements of the former, yielding means acting on said connecting means to oppose movement of the valve towards closed position, and means modifying the action of said yielding means to balance the effects of the suction and the yielding means on said member in all positions of the valve when the motor is operating at a predetermined governed speed.

Referring to the accompanying drawings, which illustrate one embodiment of the present invention:

Figure 1 is a side elevation, partly in section, of a governor constructed in accordance with the present invention;

Figure 2 is a vertical section on line 2—2 of Figure 1; and

Figure 3 is a side elevation looking from a position at right angles to Figure 1.

The numeral 10 designates a hollow casting having end flanges 11, adapting it to be secured at some convenient point in the intake conduit of a hydrocarbon motor. The casting forms a conduit 12, preferably of rectangular cross section, and a chamber 13. The governor valve 14 is preferably of the pivoted butterfly type; and, in the form

illustrated, consists of a rectangular plate secured along its transverse center line to a stem 15, which is pivoted in bearings formed in the walls of the conduit. The valve is therefore balanced against suction effects. As shown in Figure 2, one end of stem 15 projects into chamber 13, and has secured thereon an arm 16 which carries at right angles to its outer end a pin, on which is journaled an anti-friction roller 17 and one end of a link 18. The other end of link 18 is pivoted to a lug formed on the face of a piston 19, which operates in a cylinder 20 bolted to casting 10. The cylinder casting has formed therein a duct 21 which communicates with conduit 12 at a point located between the valve 14 and the intake manifold of the motor. Pivoted in chamber 13 is a cam arm 22 having attached to its free end one end of a spring 23, the other end of said spring being connected to a swivel 24 carried by an adjusting screw 25 which is threaded through the wall of chamber 13. As clearly shown in Figure 1, arm 22 is formed with a cam surface 22^a which is held in yielding engagement with roller 17 by the spring 23. Chamber 13 may be closed by a suitable cover plate 26.

Normally, that is when the motor is not running, valve 14 is held in fully open position by the operation of spring 23 acting on arm 16 through the medium of cam arm 22. When the motor is running the vacuum in the intake, caused by pump action of the engine pistons, is also produced in the cylinder space at the right of piston 19, and atmospheric pressure on the other side of said piston tends to cause movement thereof towards the right, as viewed in Figure 1; and, through the connections described, tends to cause the valve to move towards closed position. The valve will assume a position such as to cause the motor to run at the predetermined speed for which the governor is adjusted, and the position assumed by the valve will of course depend upon the load on the motor. The parts are so constructed and proportioned that the spring 23 exactly counterbalances the suction effort on piston 19 in all positions of valve 14, when the engine is running at its predetermined governed speed. If the speed of the engine varies from this governed speed the balance will be destroyed and the piston 19 will move to the right or left, closing or opening the valve, as the case may be, and reestablishing the governed speed.

As heretofore pointed out, the resistance of a spring gradually increases as it is deformed, while the vacuum in the intake increases at an accelerated rate as the valve is moved towards its closed position, with any constant R. P. M. As disclosed in said prior application, these efforts are equalized by a corrective or compensating means in order that the governor may be balanced at all positions of the valve, so long as the engine maintains its governed speed. It has been found that the corrective means most suitable for this purpose includes a cam mechanism. This is true, for the reason that a cam mechanism can be calibrated for all positions of the governor in accordance with results obtained under actual operating conditions. It is essential to the production of a stable and accurate governor performance that the corrective means employed should have this capability, for the reason that it is impossible to design any kind of corrective means merely from theoretical data. This results from the fact that the effort acting on the motive element of the governor is a variable which depends on the position and shape of the valve, the speed of the motor, the load thereon, and numerous other factors, the effects whereof cannot be predetermined but are known only by actual trial, and therefore cannot be compensated except by a corrective means which permits of alteration from its theoretical design at different positions of said means. In the case of a cam any part of the cam surface can be altered and a cam contour produced empirically which will give any desired governor performance.

Changes may be made in the specific construction described without affecting the essentials of the invention. It is obvious, for instance, that a diaphragm may be substituted for the piston, that the spring may be applied at other points than that shown, that the valve may be of a different type, etc.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. A suction responsive governor for hydrocarbon motors including in combination, a throttle valve in the fuel intake passage, a member responsive to the suction in said intake passage on the cylinder side of said valve, means connecting said member and valve operating the latter in accordance with the movements of the former, a spring operating on said connecting means to oppose movement of the valve towards closed position, and cam mechanism modifying the action of said spring to balance the suction and spring effects on said member in all positions of said valve when the motor is operating at the predetermined governed speed.

2. A suction responsive governor for hydrocarbon motors including in combination, a throttle valve in the fuel intake passage, a member responsive to the suction in said intake passage on the cylinder side of said valve, means connecting said member and valve operating the latter in accordance with the movements of the former, yielding means

opposing movement of said valve towards closed position, and cam mechanism modifying the action of said yielding means to balance the suction and yielding means effects on said member in all positions of said valve when the motor is operating at the predetermined governed speed.

3. A suction responsive governor for hydrocarbon motors including in combination, a throttle valve in the fuel intake passage, a member responsive to the suction in said intake passage on the cylinder side of said valve, means connecting said member and valve operating the latter in accordance with the movements of the former, a spring, and cam mechanism between said spring and said connecting means varying the effective force of said spring on said connecting means to balance the effects of the suction and spring on said member in all positions of said valve when the motor is operating at a predetermined speed.

4. A suction responsive governor for hydrocarbon motors including in combination, a throttle valve in the fuel intake passage, means forming a chamber adjacent said throttle valve, a member operating therein, said chamber communicating with the atmosphere on one side of said member and communicating on the opposite side of said member with the intake passage at a point between said valve and the intake manifold, means connecting said valve and member, and yielding means opposing movement of said valve towards closed position, said yielding means including cam mechanism for modifying the action thereof to balance the effects of said suction and yielding means on said member in all positions of said valve when the motor is operating at a predetermined speed.

5. A suction responsive governor for hydrocarbon motors including in combination, a throttle valve in the fuel intake passage, a member controlled by the suction in the intake passage, yielding means opposing movement of said member in response to increase of the suction effect thereon, said yielding means including cam mechanism modifying the effective opposition thereof to said suction effect to balance said member in all positions when the motor is running at a predetermined speed, and means connecting said member and valve.

6. A suction responsive governor for hydrocarbon motors including in combination, a pivoted throttle valve in the fuel intake passage, an arm rigid with the pivot of said valve, a member controlled by the suction in the intake passage connected with said arm, a spring and means connecting said spring and arm, said connecting means including a cam to modify the force exerted by said spring on said arm to balance said member in all positions when the motor is running at a predetermined speed.

7. A suction responsive governor for hydrocarbon motors including in combination, a pivoted throttle valve in the intake passage, an arm rigid with the pivot of said valve, a member controlled by the suction in the intake passage connected to said arm, yielding means operating on said arm and opposing movement of said valve towards closed position, said yielding means constructed and arranged to balance said member in all positions thereof when the motor is operating at a predetermined speed.

8. A suction responsive governor for hydrocarbon motors including in combination, a pivoted throttle valve in the fuel intake passage, an arm rigid with the pivot of said valve, a member controlled by the suction in the intake passage connected to said arm, a spring, and cam mechanism between said spring and arm for balancing said member and valve in all positions when the motor is running at a constant speed.

In testimony whereof we hereunto affix our signatures.

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ARTHUR A. BULL.