Dec. 17, 1935. T. I. LARSEN 2,024,296

GOVERNOR

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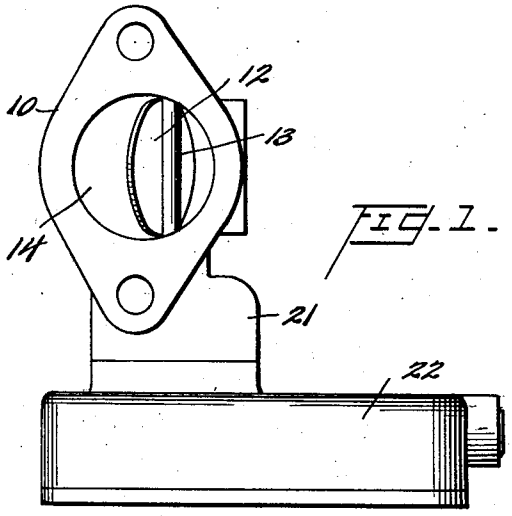


FIG. 1.

FIG. 2.

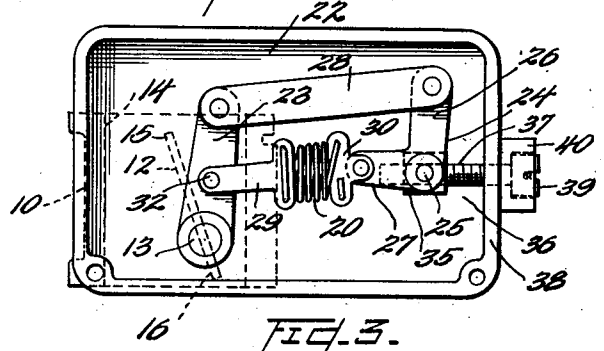
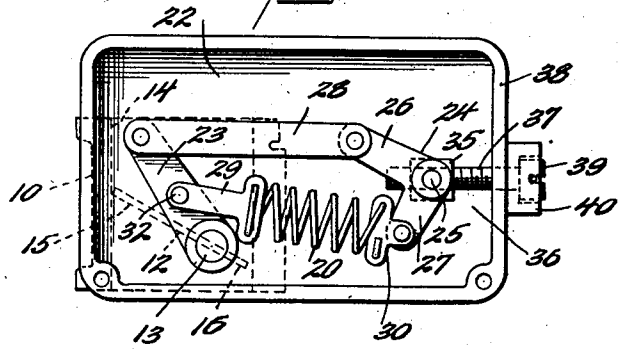


FIG. 3.



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GOVERNOR

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4 Claims. (Cl. 137—152)

This invention relates to governors and more particularly to governors of the so-called suction type intended primarily for use on internal combustion engines where they are positioned between the intake pipe and the carburetor.

It is a general object of the present invention to provide a novel and improved form of suction governor.

More particularly it is an object of the invention to provide a novel suction governor of the type in which the unbalanced or eccentrically mounted governor throttle which has its closing effort, due to the pressure and velocity of the gaseous fuel, opposed by a spring which is so connected to the governor throttle shaft as to provide a substantial balance for this effort on the valve at all positions of the valve and at a certain definite predetermined engine speed.

An important feature of the invention resides in the construction of the governor whereby the spring effort is applied to the throttle shaft without the use of cams, eccentrics, or complicated linkages, but in which by having both ends of the spring secured to movable parts the effect of the spring substantially balances the action on the throttle resulting from the moving fuel for all positions of the throttle at the predetermined speed.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawing and following specification, wherein is disclosed a single exemplary embodiment of the invention, with the understanding, however, that such changes and variations may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawing:

Figure 1 is a plan view of a governor constructed according to the present invention, and intended for use with a downdraft type of carburetor;

Figure 2 is a side elevation thereof with the cover plate removed from the spring housing, showing the spring contracted and the governor throttle wide open; and

Figure 3 is a view similar to Figure 2, showing the throttle in its closed position and the spring at its maximum expansion.

In such patents as those for "Governors" issued to Handy et al., Nos. 1,584,929 and 1,604,283, there are shown governors of the type in which the governor throttle is interposed in a portion of the intake pipe between the engine and the carburetor and opens toward the carburetor, being normally held open by a spring and urged toward the closed position by the velocity and impact of the gaseous fuel flowing to the engine. In these patented governors, in order to balance the closing effort of the throttle in all positions thereof for a predetermined speed of the engine, resort is had to various cam arrangements to effect a balance between the curve resulting when a plot is made between the angular degrees of displacement of the throttle and the turning effort on its spindle, and the straight line representing the resistance of the spring under various deflections.

In accordance with the present invention the cams and the like are eliminated, for they are expensive to manufacture, difficult to contour to exactly balance the closing effort of the valve and wear rapidly since they cannot be effectively lubricated. The result is attained in the present invention by connecting the spring to two movable points, one on a part connected to the shaft of the throttle valve and the other on a lever operated by movement of the governor valve.

Referring now to the drawing for an exemplary embodiment of the invention, the governor is shown to include a casting 10 adapted to be inserted between the flange on the intake pipe and the flange on the carburetor and having a length only slightly greater than the maximum width of the governor throttle 12, which is fixed on the shaft 13 to be rotatable to close or open the passage 14 through this part 10. The shaft extends across the passage to one side thereof so that the part 15 of the throttle plate, which extends upward when open, is much larger than the part 16 which extends downward. As viewed in Figure 2, the flow of the gas from the carburetor to the engine is downward so that it acts on the back of the large surface 15 by impact as well as on the front by suction to form a closing effort on the throttle which increases as the speed of the engine increases. In order that this closing effort be resisted by a substantially equal and opposite force at all positions of the valve for a predetermined engine speed with varying loads, a spring 20 of the coil type is provided connected as will be described.

The shaft 13 has a bearing at each side of the passageway 14 and extends through a portion 21 of the casting into the spring housing 22 at one side thereof and attached to this shaft for movement therewith, and in the housing 22 is the lever arm 23. A bell crank lever 24 is pivoted on a stud 25 and has the long arm 26 and the short arm 27. The long arm 26 is connected by the piv-

oted link 28 to the outer end of the crank shaft arm 23 while the short arm 27, which normally is directed toward the center of the arm 23, is connected to that arm by the spring 20 which has end members 29, 30 for the purpose. Each of these end members is perforated so that the spring can be threaded through the same and have a direct pull imparted thereto. The member 29 has a slight extension which is pivoted at 32 to the arm 23 intermediate its ends while the short extension on the end member 30 is pivoted to the shorter arm of the bell crank lever.

It will be seen that the pull on the short arm of the bell crank lever is substantially along its axis through its pivot while the pull of the other end of the spring is such as to urge the valve toward its open position. If now the closing effort on the throttle, due to the action of the engine, increases, there will be a tendency to increase the speed of the engine but the throttle will move under this closing effort to another position to reduce the velocity and the quantity of fuel so that the engine runs at substantially the same speed but under a different load. The maximum condition will prevail when there is no load on the engine and the throttle will substantially close, as shown in Figure 3, although there is a slight clearance to prevent complete stoppage of the engine, which clearance is preferably at the short end 16 of the throttle.

Under these conditions the arm 23 will be swung in a counterclockwise direction, extending the spring 20 as shown, and at the same time, under the action of the link 28, rotating the bell crank lever in a counterclockwise direction. This will lower the right hand end of the spring and move it to the right so that the spring is extended to a greater distance than if its right hand end were fixed and the left hand end solely moved under the action of the lever 23. Two different effects are produced by this bell crank lever mounting of the right end of the spring, the first comprising a considerable lengthening of the spring at a more rapid rate than results from the direct movement of the arm 23 and the second a change in the angular relationship between the axis of the spring and the axis of the lever 23, different from that which would take place if the right hand end of the spring were fixed.

By properly adjusting the lengths of the arms of the bell crank lever, their initial angularity, and the strength and positions of the spring fastenings, it has been found that a substantial balance can be effected for the throttle closing effort at all positions thereof for some predetermined speed of the engine where all the features are designed for the particular engine, having in mind the vacuum curve thereof.

In order that the governed speed of the engine may be adjusted, the pivot 25 for the bell crank lever is a stud on a large nut 35 which has a flat face which slides along the bottom 36 of the spring housing and is prevented from rotating thereby. It is threaded onto a screw 37 the shank of which passes through an aperture in the side wall 38 of the housing and the head 39 of which is sunk in a sleeve 40 preferably cast integral with the wall 38. The slot in the screw head to receive a screw driver for adjustment may also provide for the passage of a sealing wire which may pass through apertures in the sleeve 40 and serve not only to prevent tampering with the adjusted speed of the governor but to prevent any slipping of the screw during operation.

The construction is extremely simple and cheap to manufacture, and has a minimum of moving parts with all wearing and bearing surfaces of the pivoted type which need a minimum of lubrication.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A governor for an internal combustion engine comprising an intake conduit, an unbalanced butterfly throttle therein, and a counterbalancing means connected to balance the turning effort of said throttle at a predetermined engine speed consisting of a single spring, an arm secured to turn with the throttle, a bell crank lever pivoted near said arm, said spring being stretched between one leg of said lever and an intermediate portion of said arm and a link forming the sole connection between the other leg and the end of said arm whereby both ends of the spring move when the throttle is moved.

2. In a governor for internal combustion engines, in combination, an unbalanced throttle, a spring counteracting the closing effort of the fuel on said throttle, an anchor lever for the spring, said spring connecting said lever to said throttle, means to move said lever in unison with the throttle, a pivot for said lever and means to adjust the position of said pivot to adjust the initial length of the spring to regulate the governed speed.

3. A governor for an internal combustion engine comprising an intake conduit, an unbalanced butterfly throttle therein, and a counterbalancing means connected to balance the turning effort of said throttle at a predetermined engine speed including a single spring, an arm secured to turn with the throttle, said spring having one end operatively associated with said arm, a lever having a normally fixed pivot and having the opposite end of the spring connected thereto, means to rotate said lever in unison with the arm and means to adjust the position of said pivot to adjust the length of the spring to change the governed speed.

4. A governor for an internal combustion engine comprising an intake conduit, an unbalanced butterfly throttle therein, and a counterbalancing means connected to balance the turning effort of said throttle at a predetermined engine speed including an arm secured to turn with the throttle, a bell crank lever pivoted near said arm, a spring stretched between one leg of said lever and an intermediate portion of said arm, a link connecting the other leg and the end of said arm whereby both ends of the spring move when the throttle is moved and means to adjust the position of said pivot to adjust the length of the spring to change the governed speed.

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