July 30, 1935. H. DAHNKE 2,009,967

GOVERNOR FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 23, 1933 2 Sheets-Sheet 1

Fig. 1.

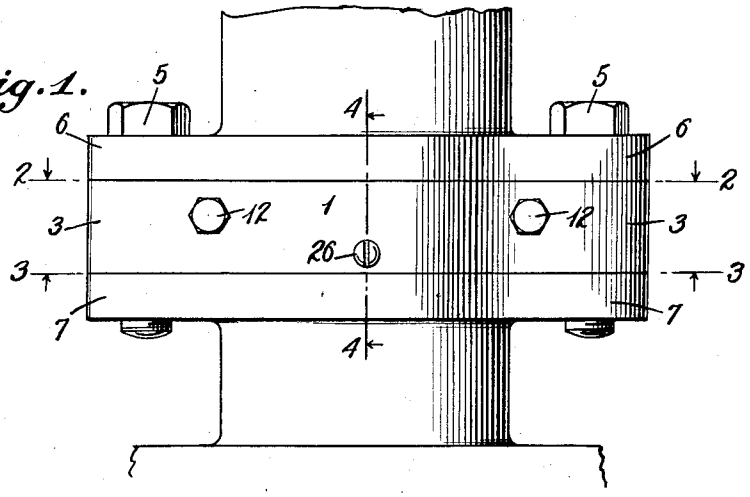


Fig. 2.

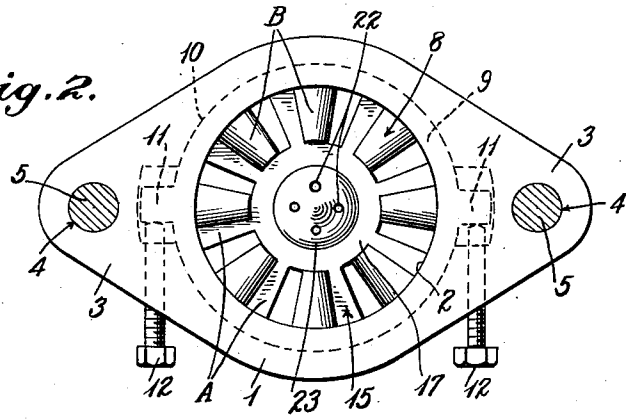
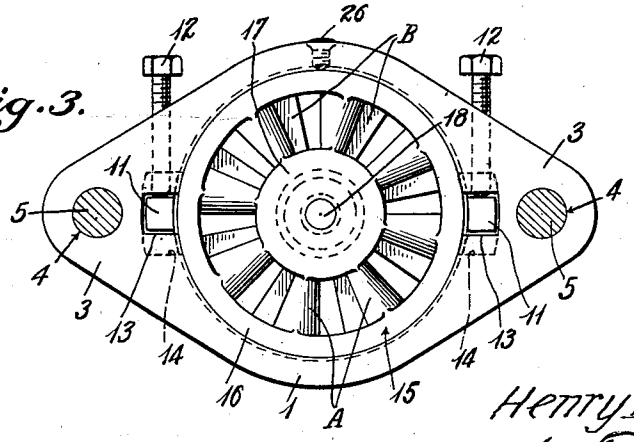


Fig. 3.



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Filed Oct. 23, 1933 2 Sheets-Sheet 2

Fig. 4.

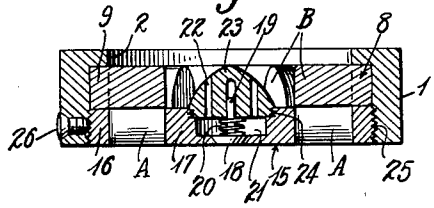
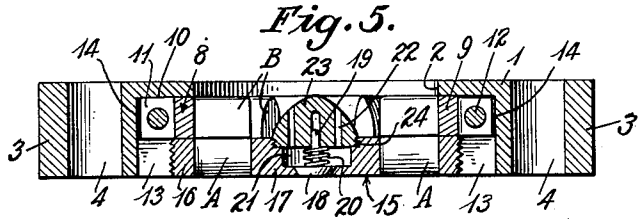


Fig. 5.



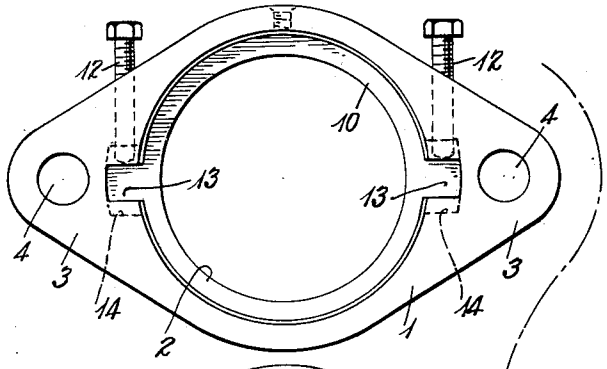
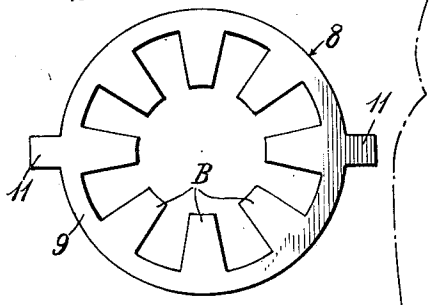


Fig. 6.



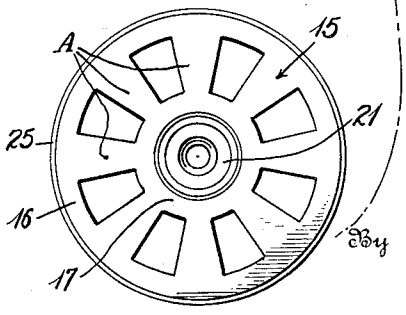
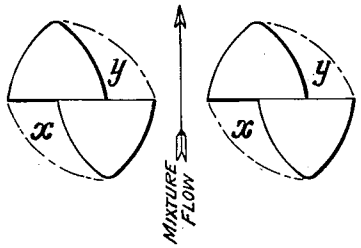


Fig. 7.



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Patented July 30, 1935

2,009,967

UNITED STATES PATENT OFFICE

2,009,967

GOVERNOR FOR INTERNAL COMBUSTION ENGINES

Henry Dahnke, United States Army

Application October 23, 1933, Serial No. 694,816

3 Claims. (Cl. 137—75)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes without payment of any royalty thereon.

This invention relates to improvements in governors for internal combustion engines, and more specifically to a device wherein mechanical moving parts are eliminated and what may be termed a synthetic streamline passage for fuel is provided, the capacity of said passage and maximum speed of the engine being controlled by the coaction of the valve members and the speed of flow of fuel, said fuel itself forming the streamline passage due to the form and set of the valve.

An object of this invention is to provide a simple, durable and inexpensive structure of the class described, having simple and quickly operable means that do not require the attention of an expert, when adjustment is necessary.

Another object is to provide a device that may be applied to practically any form of or make of motor, is adapted to be inserted in a connection between the carburetor and the intake manifold and may be provided with ears having openings, through which clamp bolts slightly longer than regular equipment, may be employed, the latter being the only change required when applying the present invention to an engine.

A further object is to provide a device of sturdy construction having no moving parts, and one that may be set and locked in its adjusted position, thus eliminating the questions of failure due to fouled bearings and breakage.

A further object is to provide a synthetic streamline fuel passage of maximum freedom of flow, at predetermined maximum speed of the engine.

Another object is to provide means whereby the flow of fuel will automatically be gradually diminished, by its own flow, when the engine exceeds desired maximum speed.

The above and other objects will appear in the following description and be pointed out in the claims.

A preferred embodiment of this invention is shown for the purpose of illustrating the application of the invention only, it being understood that the principles may be practiced with slight changes and modifications, all falling within the scope of this invention.

Similar numerals indicate corresponding parts in all the figures of the drawings, in which:

Fig. 1 is an elevation of the improved governor, showing fragments of adjacent parts of the carburetor and manifold.

Fig. 2 is a top plan view of the governor, showing parts of the adjustable valve member in dots.

Fig. 3 is an inverted plan view of the governor.

Fig. 4 is a vertical section of the governor, taken on line 4—4 of Fig. 1.

Fig. 5 is a vertical section of Fig. 1 taken at right angles to Fig. 4.

Fig. 6 shows separated views of the valve members.

Fig. 7 is a diagrammatic view of two arms each of the fixed and movable valve members, showing in dotted lines the pressure and drag areas, combining to form the synthetic streamline fuel passage between the arms at predetermined maximum speed of the engine.

Governors having moving parts in the fuel passage to control the flow are always subject to breakage or other failure, which is the principal objection to such devices. The moving parts must be operated by the flow of fuel and are necessarily of a delicate construction, to be sensitive to the variations in said flow, and as a result of said construction are quickly worn, or are injured and fail to function properly.

Referring to the drawings by numerals, 1 indicates the body of the governor, having a central opening 2, ears 3 are provided with opening 4 through which bolts 5 pass to secure the governor between flanges 6 and 7 corresponding in shape, on the manifold and carburetor respectively.

In the present application of my invention, valve members of the circular type are employed. Said valve members are provided with radial arms of a specific cross section, which when in position coact, in combination with the flow of fuel, to form passages between the arms of the valve to control the flow of fuel and govern the speed of the engine.

In the construction shown an adjustable valve 8 is rotatably mounted in the body portion 1, said valve having radial arms B extending inwardly from a peripheral arm supporting ring 9. Said adjustable member is mounted for rotary movement in groove 10, and is provided with lugs 11 arranged on opposite sides, against which adjusting screws 12, threaded in the body portion are adapted to operate and increase or diminish the passages for fuel between the arms of the valve members. Axially extending slots 13 in the body 1 permit the assembly of the parts, said lugs 11, when the valve member 8 is seated, are adapted to operate when adjusted into lateral openings 14 formed in the body portion 1 on either side of slots 13.

A fixed valve 15 is provided with arms A of

practically the same cross section as arms B, said arms B connect peripheral ring **16** and a central portion **17** the latter being provided with a high suction valve consisting of valve head **18**, having a stem **19** around which compression spring **20** is coiled and is adapted to retain the valve in its seat against normal suction conditions. Excessive suction opens the valve and a small amount of fuel is drawn into cavity **21** and from there through ducts **22** into the general fuel flow that has passed the governor. Any preferred form of high suction valve may be used, the one shown having a streamline plug **23** screw threaded at **24** into the fixed valve member, in which ducts **22** are formed, the stem of the valve, being mounted in said plug thus permitting easy assembly of the parts.

The fixed valve member which in the structure shown is adapted to retain the adjustable valve member in place, may be threaded at **25** into portion **1** and be secured against accidental displacement by lock screw **26**.

While the drawings show the flow of fuel from its source through the fixed valve and then through the adjustable valve thence on to the engine, this arrangement may be reversed, it being the cross sectional formation of the arms that is of importance in this invention, both being practically the same and may be arranged as shown or reversed in position.

With special reference to Fig. 7, sectional views of two pairs of valve arms are shown, B the adjustable arms and A the fixed arms. By dotted lines are shown pressure areas X and turbulence areas Y.

Assuming the mixture to be moving in the direction of the arrow, a pressure area X is built up, due to the projection of a portion of B beyond A, said built up area giving the areas ABX, so far as the whole lower right portion of the fuel passage is concerned, a streamline formation.

Area Y on the other side of the fuel passage acts as a drag on the flow of fuel, the projection of A beyond B setting up the area Y of turbulence.

At low speed, turbuence area Y and drag on the flow of fuel is negligible and area X is of small dimensions.

As the speed of the engine passes its predetermined maximum speed, turbulence Y increases and with the increased pressure area X, due to the increased speed of the mixture through the fuel passage, the effect of a diminished passage is obtained and the speed of the engine is reduced to adjusted maximum speed.

The control of the speed is a function of the pressure area X and the turbulence area Y, both of which are due to the adjustment of the rotatably adjusted valve B, which should be at a point at which the arm of the fixed valve A forms with the area X the most perfect streamline head, and turbulence Y is not enough to excessively impede the movement of the fuel through the valve.

When the above adjustment is obtained at the desired maximum speed, the mixture flows smoothly through the valve due to the synthetic streamline passage, which results in little or no power absorption by the governor up to the time when the engine reaches desired maximum speed.

Further, said synthetic streamlining is built up gradually with a gradual increase or decrease in speed of fuel, with the result that no bucking of the engine is experienced. The central high suction valve, in connection with the above functioning as an accelerating medium, the latter having been demonstrated by closing said central high suction valve, when no instant acceleration developed, but when said valve was allowed to function, the engine manifested normal acceleration.

Relative to the absence of bucking of the engine with this form of device it may be stated that in other governors, spring pressed sliding parts are provided to control the flow of fuel, the movement of said mechanical parts being controlled by the flow of fuel, in which instances in order to move the sliding parts, there must be a mixture pressure greater than the spring pressure plus the inertia of the moving parts, which when overcome, there is an excess pressure, which causes said moving parts to move in flow diminishing direction, further, at greater speed and not in proportion to the pressure but at a jump thus causing the engine to buck.

When the sliding parts as stated above have jumped to the extreme of their movement, and they are to return to their original position, the spring pressure must be greater than the mixture pressure plus the inertia of said parts, and once said inertia is overcome, the parts will jump back to the opposite extreme of their movement. Said parts, after being once started in either direction will with their own inertia cause too sudden a reduction or increase in the mixture pressure, and bucking of the engine will be the result.

In the present invention, there is no inertia of the parts or initial spring pressure to overcome, there being only a pressure area which varies, after the adjustment of the valve member, by the speed of the mixture through the valve, said pressure area as stated above having no inertia and is of streamline shape. The increase and reduction of the passage is in direct proportion to the speed of the mixture and the adjustment of the governor, and bucking is eliminated.

In other words instead of using mechanical moving parts, advantage has been taken of the laws of flow of the mixture, whereby the passage is gradually increased and reduced by a corresponding increase and reduction of the pressure area and drag, which forms what may be termed a built-up or synthetic fluid passage, controlled by the speed of flow of the mixture, the valve members functioning as supports for said passage forming fluid.

Having described my invention what I claim and desire to secure by Letters Patent is:

1. A device of the class described comprising a body portion, a passage through the body portion, disc shaped members arranged transversely across said passage, with their adjacent faces in contact, one of said discs being rotatably adjustable, said members each having an equal number of radiating spokes and open spaces therebetween, said spokes having flat contacting faces and tapering in cross section toward remote edges to form pockets increasing in size in opposite directions adapted to provide pressure and turbulence areas, the volume of fuel in said areas increasing as the speed of flow of fuel increases, diminishing the passage and controlling the flow of fuel.

2. A device of the class described comprising a body portion, a passage through the body portion, disc shaped members arranged transversely across said passage, with their adjacent faces in contact, one of said discs being rotatably adjustable, said members each having an equal number of radiating spokes and open spaces therebetween,

said spokes having flat contacting faces and tapering in cross section toward their opposite faces adapted to form pressure and turbulence pockets for fuel on the receiving and discharging sides of said discs respectively and provide pressure and turbulence areas, the volume increasing with the increase of speed of flow of fuel to control same.

3. A device of the class described comprising a body portion, a passage through the body portion, disc shaped members arranged transversely across said passage, with their adjacent faces in contact, one of said discs being rotatably adjustable, said members each having an equal number of radiating spokes and open spaces therebetween, said spokes having flat contacting faces and tapering in cross section toward remote edges, pressure areas having flat faces arranged at right angles to the flow of fuel, and receding side surfaces, turbulence areas having sharp edges and open spaces immediately adjacent thereto, in the line of flow of the fuel, said pressure areas and turbulence areas adapted to increase as the flow of fuel increases, diminish the area of the passage and flow of fuel.

HENRY DAHNKE.