

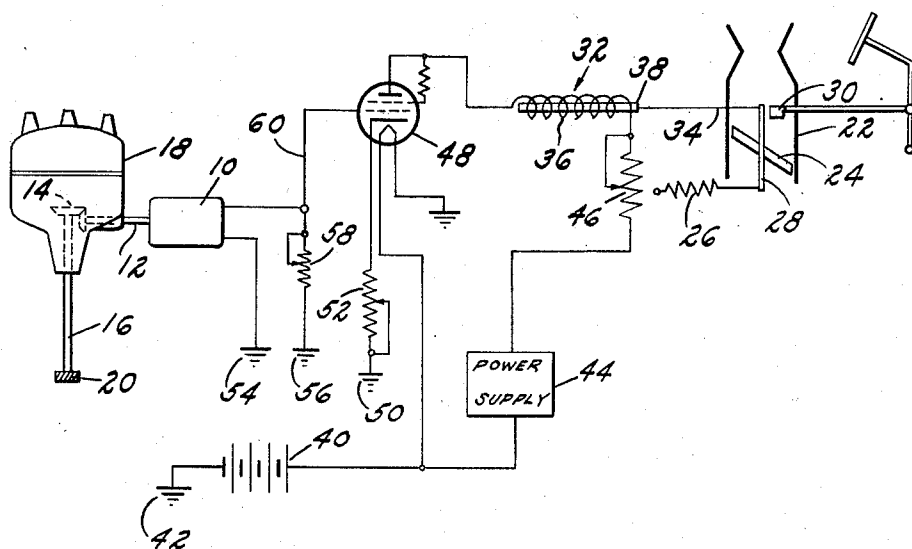
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2,908,264

ELECTRONIC SPEED GOVERNOR

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ELECTRONIC SPEED GOVERNOR

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13 Claims. (Cl. 123—102)

The present invention relates to an electronic speed governor for an internal combustion engine.

It is an object of the present invention to provide an electronic governor characterized by its sensitivity to speed variation, the characteristic of instantaneous response thereto, and the ease with which it may be adjusted to produce speed regulation at various predetermined speed levels.

It is a feature of the present invention to provide an electronic speed governor for an internal combustion engine comprising essentially means for generating an electrical impulse related to engine speed, and employing this impulse in an electrical circuit to effect speed regulation.

More specifically, it is a feature of the present invention to apply the electrical impulse to the control grid of a vacuum tube in a circuit including electromotive means connected to the throttle of the internal combustion engine.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawing, wherein the figure is a diagrammatic illustration of the electronic governor system.

In accordance with the present invention the engine speed governor operates on the principle of electronic power multiplication. An electrical impulse which is related to engine speed is developed as for example by a small generator, positively driven from a rotating part of the engine. Alternatively, the electrical impulse may be of other types such as, for example, an electro-magnetic pick-up around a spark plug wire, etc.

Conveniently, the system involves a small generator 10 having a drive shaft 12 illustrated as connected by bevel gearing 14 to the distributor shaft 16 of the ignition distributor indicated generally at 18. This shaft is connected by suitable gearing, one element of which is indicated at 20, to the cam shaft of the internal combustion engine.

It is assumed that the internal combustion engine to which the ignition distributor 18 is connected, includes a fuel intake passage 22 having a movable throttle plate 24 therein. The throttle plate is illustrated in the figure in substantially closed position and is diagrammatically illustrated as urged toward open position by a tension spring 26 connected to a lever 28 which in turn is connected to the pivot shaft of the throttle plate. In the case of a pedal controlled internal combustion engine, the pedal may actuate a movable stop 30 and when operating below governed speed, the spring 26 maintains the lever 28 in contact with the movable stop or abutment 30, thereby determining the position of the throttle.

In accordance with the present invention electromotive means indicated generally at 32 is provided which is connected as by a link 34 to the throttle actuating lever 28. Specifically, the electromotive means 32 is in the form of a solenoid comprising a winding or coil 36 having a movable plunger or armature 38 associated therewith.

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The control circuit for the electromotive means 32, in the illustrated showing, comprises a battery 40 grounded as indicated at 42 and connected through a power supply 44, adjustable resistance 46, and the winding 36 to the plate of the vacuum tube 48. The vacuum tube, as diagrammatically illustrated, has its cathode grounded as indicated at 50 through an adjustable resistance 52.

The generator 10 comprises terminals grounded at 54 and 56, one of these connections including an adjustable resistance 58. Intermediate the generator and the resistance 58 is a connection 60 to the grid of the vacuum tube 48.

In practice, a substantially more complex circuit may be employed but for purposes of illustration, a single electronic tube is shown.

The electrical characteristics of this amplifier, determined in part by the resistances 58 and 52, and by the electric power supply 44, can be adjusted so that no current is conducted through the vacuum tube amplifier until the input voltage from the generator 10 reaches a predetermined value. Thus, up to this point, control of the engine may be manual by movement of the adjustable abutment 30. When the voltage developed by the generator and applied to the grid of the vacuum tube reaches the preset value, current flows through the electromotive means 32 and applies a force tending to move the throttle 24 toward closed position. By proper selection of the electrical characteristics of the vacuum tube, and determined in part again by the resistances 52 and 48 and the power supply 44, any small increase of voltage applied to the grid of the vacuum tube may produce a larger increase in current flow through the electromotive means. At the same time, it will be appreciated that actual current flow at speeds above the governed speed will be a function of engine speed. In other words, the instantaneous position of the throttle plate, while speed is being controlled by the electronic governor, will be a function of engine speed and the throttle opening will be maintained at the proper value as determined by the load.

In the illustrated system, the cut-off point is determined by varying the resistance of resistors 52 and 58, while the full load to no load r.p.m. spread can be varied by changing the electrical resistance of resistor 46.

A prime advantage of the present system is that the reaction to speed variation is for all practical purposes instantaneous, leaving little or no time for the engine to overspeed before the throttle position correction can be accomplished. Thus, reaction time is negligible. With proper selection of electrical components, the device is able to govern engine speed with a minimum r.p.m. spread from full load to no load, and with excellent regulation.

The drawing and the foregoing specification constitute a description of the improved electronic speed governor 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. An electronic governor for an internal combustion engine having a throttle plate, electromotive means adapted to be connected to said throttle, means for establishing an electrical condition variable with engine speed, an electrical power source connected to said electromotive means, and electronic means responsive to the variable electrical condition to control the current supply to said electromotive means.

2. An electronic governor for an internal combustion engine having a movable speed control member, electromotive means connected directly to said member, means for establishing an electrical condition variable with engine speed, an electrical power source connected to said electromotive means, and electronic means re-

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sponsive to the variable electrical condition to control the current supply to said electromotive means.

3. In an internal combustion engine having a movable speed control member, means urging said member in a direction to increase engine speed, means responsive to engine speed for establishing an electrical impulse whose intensity is a function of engine speed, electromotive means connected to said member, means for supplying current to said electromotive means to operate said electromotive means to develop forces tending to move said member in a direction to reduce engine speed, and means responsive to the intensity of said impulse for controlling said electromotive means.

4. An electronic governor for an internal combustion engine having a speed regulating throttle, resilient means connected to said throttle to open said throttle, electromotive means instantly response to engine speed inoperable below a selected governed speed and operable upon attainment of a speed in excess of governed speed for moving said throttle toward closed position against the action of said resilient means.

5. Structure as defined in claim 4 in which said electromotive means comprises a solenoid connected to said throttle, and a circuit for said solenoid including electronic control means responsive to engine speed.

6. Structure as defined in claim 5, said control means comprising a vacuum tube having a grid, and means for establishing a voltage which is a function of engine speed connected to said grid.

7. An electronic governor for an internal combustion engine having a throttle plate, resilient means biasing said throttle plate toward open position, and a manually controlled adjustable abutment limiting opening movement of said throttle plate, said electronic governor comprising electromotive means connected to said throttle plate and adapted when energized to apply closing forces thereto, an electronic circuit for said electromotive means including means responsive directly to engine speed for preventing actuation of said electromotive means below a predetermined engine speed and for actuating said electromotive means in throttle closing direction instantaneously upon attainment of a speed in excess of the desired speed.

8. A governor as defined in claim 7 in which said speed responsive means comprises in combination a vacuum tube having a control grid and a generator adapted to be driven at a speed dependent upon engine speed, said generator being connected to said control grid.

9. An electronic governor as defined in claim 8 com-

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prising first adjustable means for determining the engine speed at which said vacuum tube commences to conduct, and additional means for adjusting the full load to no load r.p.m. spread.

10. An electronic governor for an internal combustion engine having a throttle plate, electromotive means establishing an electrical condition variable with engine speed, an electrical power source connected to said electromotive means, and electronic means responsive to the variable electrical condition to control the current supply to said electromotive means in direct relation to engine speed.

11. An electronic governor for an internal combustion engine having a throttle plate, electromotive means adapted to be connected to said throttle, means for establishing an electrical condition variable with engine speed, an electrical power source connected to said electromotive means, and electronic means responsive to gradual variations in the variable electrical condition to control the current supply to said electromotive means.

12. An electronic governor for an internal combustion engine having a throttle plate, electromotive means adapted to be connected to said throttle, means for establishing an electrical condition variable with engine speed, an electrical power source connected to said electromotive means, and electronic means responsive to a gradual variation in the variable electrical condition to control the current supply to said electromotive means in direct relation to engine speed.

13. An electronic governor for an internal combustion engine having a throttle plate, resilient means normally biasing said throttle plate in the open position, electromotive means adapted to be connected to said throttle to close said throttle in opposition to said resilient means by an amount proportional to the current supplied thereto, means for establishing an electrical condition variable with engine speed, an electrical power source connected to said electromotive means, and electronic means responsive to the variable electrical condition to control the current supply to said electromotive means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,908,264

October 13, 1959

Fred S. Kerr

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 6, after "means" insert -- adapted to be connected to said throttle, means for --.

Signed and sealed this 3rd day of May 1960.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents