Title: GOVERNOR FOR A MOTOR VEHICLE ENGINE

Abstract: The invention provides for a governor (10) for a motor vehicle engine. The governor (10) includes a series of strain gauges (14) for measuring changes in the load of a motor vehicle (12) and a microprocessor controlled printed-circuit board (PCB) (22) for computing a predetermined maximum velocity for the vehicle based on the vehicle load. The PCB is electronically linked to the strain gauges (14) via an amplifier (18) and an analogue/digital converter (20), and is arranged to control rotation generated by the engine via an engine management system (13) so as to prevent the engine from powering the vehicle to an actual velocity greater than the predetermined maximum velocity.
GOVERNOR FOR A MOTOR VEHICLE ENGINE

BACKGROUND OF THE INVENTION

This invention relates to a governor for a motor vehicle engine.

Motor vehicle accidents on public roads are often caused by heavily loaded or overloaded vehicles. These vehicles tend to have a relatively high momentum and consequently are fairly difficult to stop. Despite this, many drivers of heavily loaded or overloaded vehicles increase the momentum of the vehicle by driving at high speeds.

Conventional governors for vehicle engines are designed to limit the maximum velocity of the vehicle. Although these governors prevent the engine from powering the vehicle beyond a predetermined velocity, they act independently of the load of the vehicle and accordingly do not limit the momentum of the vehicle.

It is an object of the present invention to provide an alternative governor for a motor vehicle engine which is dependent upon the load of the vehicle.
SUMMARY OF THE INVENTION

According to the invention there is provided a governor for a motor vehicle engine including:

a mechanism for measuring changes in the load of a motor vehicle;

computing means for computing a predetermined maximum velocity for the vehicle based on the vehicle load; and

control means for controlling rotation generated by the engine so that the engine is prevented from powering the vehicle to an actual velocity greater than the predetermined maximum velocity.

In a preferred embodiment of the invention, the mechanism for measuring changes in the load of the vehicle includes at least one strain gauge, and the computing means includes a microprocessor controlled printed-circuit board (PCB) which is electronically linked to the at least one strain gauge via an analogue/digital converter.

In a particularly preferred embodiment, the governor includes a transducer for converting rotational velocity of a wheel axle or a propeller shaft on the vehicle into a signal representing the actual velocity of the vehicle. In this case, the transducer may be arranged to detect a marker on the propeller shaft of the vehicle as this shaft rotates and to transmit an electronic signal representative of the actual vehicle velocity to the PCB.

Typically, the PCB is arranged to compare the actual velocity of the vehicle with the computed predetermined maximum velocity and to regulate the
rotation of a drive shaft on the engine via an engine management system or other device for controlling rotation generated by the engine.

The governor may include a brake which is electronically linked to the PCB for preventing the vehicle from exceeding the predetermined maximum velocity on a downhill.

The governor may also include a display unit, typically on the vehicle dashboard, for displaying the vehicle load.

Preferably, the various components of the governor are housed in protective casings to prevent unauthorised tampering with these components.

In another embodiment of the invention, the signal representing the actual vehicle velocity is derived directly from the vehicle speedometer.

The invention also extends to a method of governing a motor vehicle engine including the steps of:

- measuring changes in the load of a motor vehicle;
- computing a predetermined maximum velocity for the vehicle based on the vehicle load; and
- controlling rotation generated by the engine so that the engine is prevented from powering the vehicle to an actual velocity greater than the predetermined maximum velocity.
BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows, diagrammatically, a governor for a motor vehicle engine according to the present invention fitted to a motor vehicle;

Figure 2 shows a schematic representation of the governor of the invention; and

Figure 3 shows a flow diagram of the various steps carried out by a program running on a microprocessor controlled PCB forming part of the governor of the invention.

DESCRIPTION OF AN EMBODIMENT

A governor for a motor vehicle engine according to the present invention is illustrated in Figure 1 of the accompanying drawings. The governor is designated generally with the reference numeral 10 and is fitted to a vehicle 12 so as to be electronically connected to an engine management system 13 of the vehicle.

The governor 10 includes a series of strain gauges 14 (only one of which is shown) which are strategically mounted to the vehicle 12 at different stress points on the vehicle chassis 16. The strain gauges are linked to an amplifier 18 for amplifying analogue signals from these gauges, and the amplifier is
electronically linked to a microprocessor controlled printed-circuit board (PCB) 22 via an analogue/digital converter 20. Accordingly, as shown most clearly in Figure 2 of the accompanying drawings, analogue signals $S_1$ transmitted from the strain gauges 14, in use, are amplified and subsequently converted into digital signals $S_2$ prior to being transmitted to the PCB 22.

In this embodiment of the invention, the governor 10 includes a transducer 24 (see Figure 1) for converting rotation of a propeller shaft 26 on the vehicle into an electronic signal representative of the actual velocity of the vehicle. The transducer 24 comprises a marker 28 on the propeller shaft and a sensor 30 on the vehicle body for sensing the marker each time it rotates past the sensor and transmitting an electronic signal $S_3$ (see Figure 2) representative of the actual vehicle velocity to the PCB 22.

The PCB is arranged to compare the actual vehicle velocities as represented by the signals $S_3$ with computed, predetermined maximum vehicle velocities based on the signals $S_2$ and to transmit signals $S_4$ to the engine management system 13 for regulating the rotation generated by the engine.

The strain gauges 14 are suitably calibrated so that the computed, predetermined maximum vehicle velocities ensure that the vehicle does not develop an unacceptably high momentum during use.

In practice, when the vehicle is overloaded, for example when too many passengers board the vehicle, the strain gauges 14 measure values representative of additional loading over and above a predetermined operational load and transmit signals $S_1$ via the amplifier 18 and the analogue/digital converter 20 to the PCB 22. The PCB then computes a predetermined maximum velocity for the vehicle based on the load of the
vehicle as indicated by the signal $S_2$ so that as more and more people are loaded into the vehicle, the predetermined maximum velocity of the vehicle is automatically reduced.

When the vehicle 12 accelerates from a stationary condition, the transducer 24 transmits signals $S_3$ to the PCB, and the PCB compares the actual velocity of the vehicle (as represented by the signals $S_3$) with the computed predetermined maximum vehicle velocity. As long as the signals $S_3$ represent an actual velocity which is less than or equal to the predetermined maximum velocity, the output signal $S_4$ transmitted to the engine management system 13 allows the engine to accelerate. However, when the signals $S_3$ represent an actual velocity which is greater than the predetermined maximum velocity, the output signal generated by the PCB causes the engine management system to prevent any further acceleration of the engine. In this way, the governor 10 prevents the vehicle 12 from accelerating beyond a predetermined maximum velocity for a given overload condition of the vehicle and thereby ensures that the vehicle does not develop an unacceptably high momentum.

In the illustrated embodiment, the governor 10 includes a system which reduces the predetermined maximum velocity of the vehicle automatically if the vehicle travels without stopping for a predetermined time. For example, if the vehicle is used on a long journey, the system may be arranged to reduce the predetermined maximum velocity of the vehicle by 20km/h every five minutes after an uninterrupted driving time of, say, two hours. In this way, the driver of the vehicle is forced to stop and rest at least every two hours. The system typically is arranged to reset the predetermined maximum vehicle velocity after the vehicle has been stationary for at least ten minutes.
The various components of the governor 10 are housed within protective casings (not shown) so as to prevent unauthorised tampering with these components. In addition, the PCB 22 is designed to carry out various error checks for detecting unauthorised tampering with the governor, and to respond to such tampering by, for example, effecting a significant reduction in the predetermined maximum velocity of the vehicle.

Figure 3 of the accompanying drawings illustrates the various steps which a program running the PCB 22 carries out, in use. As can be seen, the first step 110 determines whether or not a timer has exceeded a six months period. If so, a warning light is illuminated in the vehicle to warn a driver that the vehicle requires attention at a service centre. Typically, at the service centre the vehicle is checked for basic roadworthiness and the timer is reset. If the vehicle is not taken to a service centre within a short time, say one week, the predetermined maximum velocity of the vehicle is reduced substantially to make further use of the vehicle impractical.

Where the timer indicates that the six months period has not yet expired, the next step 120 determines whether or not the vehicle is overloaded. In this regard, each vehicle has a set loading limit allocated to it, and beyond that limit the strain gauges 14 serve to determine the extent to which the vehicle is overloaded. If the vehicle is overloaded, the PCB 22 determines in step 130 whether or not the vehicle is moving based on the signals $S_3$. If the signals $S_3$ indicate that the vehicle is stationary the PCB automatically limits rotation generated by the engine via the engine management system 13 to, for example, 2000 revolutions per minute. This serves to account for instances where a vehicle is driven subsequent to tampering with the transducer 24.
As soon as the vehicle begins moving, the PCB 22 computes and applies the predetermined maximum vehicle velocity, as described above, and the monitoring of variations in the load of the vehicle is interrupted. This is to prevent continuous changes to the predetermined maximum vehicle velocity as a result of minor flexing of the vehicle chassis during travel. Each time the vehicle stops, for example to offload passengers and/or load additional passengers, the steps 120 and 130 are repeated, and each time the vehicle begins travelling again, the PCB computes and applies the predetermined maximum vehicle velocity at step 140.

As mentioned above, the governor 10 also monitors the total uninterrupted travel time of the vehicle. In this regard, step 150 involves checking whether or not the total uninterrupted travel time exceeds a given period, say 2 hours. If not, the PCB 22 continues calculating and applying the predetermined maximum vehicle velocity. If the relevant time period is exceeded, a warning light is illuminated to indicate that the driver should rest, in this case for 10 minutes. If the driver does not stop the vehicle, the PCB 22 automatically reduces the maximum vehicle velocity to such an extent that further travel is rendered impractical. Once the vehicle has remained stationary for the required time, the program returns to step 110.

In another, non-illustrated embodiment of the invention, the governor is connected directly to the speedometer of the vehicle, and the signal representing the actual velocity of the vehicle is derived directly from the vehicle speedometer. It will be appreciated that in this embodiment the governor does not include a transducer.

An advantage of the governor according to the present invention is that, unlike conventional governors for motor vehicle engines which limit the
maximum velocity of the vehicle irrespective of the vehicle load, it decreases the maximum velocity of the vehicle as the load of the vehicle increases and thereby serves to limit the momentum of the vehicle. Furthermore, the governor of the invention can be used to regulate the length of uninterrupted driving time in a vehicle and the length of time between vehicle servicing.
CLAIMS

1. A governor for a motor vehicle engine including:

   a mechanism for measuring changes in the load of a motor vehicle;

   computing means for computing a predetermined maximum velocity for the vehicle based on the vehicle load; and

   control means for controlling rotation generated by the engine so that the engine is prevented from powering the vehicle to an actual velocity greater than the predetermined maximum velocity.

2. A governor according to claim 1, wherein the mechanism for measuring changes in the load of the vehicle includes at least one strain gauge, and the computing means includes a microprocessor controlled printed-circuit board (PCB) which is electronically linked to the at least one strain gauge via an analogue/digital converter.

3. A governor according to claim 2, including a transducer for converting rotational velocity of a wheel axle or a propeller shaft on the vehicle into a signal representing the actual velocity of the vehicle and for transmitting this signal to the PCB.

4. A governor according to claim 3, wherein the transducer includes a sensor which is arranged to detect a marker on the propeller shaft of the vehicle as this shaft rotates.
5. A governor according to claim 2, wherein the PCB is electronically linked to a speedometer on the vehicle.

6. A governor according to any one of claims 3 to 5, wherein the PCB is arranged to compare the actual velocity of the vehicle with the computed predetermined maximum vehicle velocity.

7. A governor according to any one of claims 2 to 6, wherein the PCB regulates the rotation generated by the engine via an engine management system.

8. A governor according to any one of claims 2 to 7, including a brake which is electronically linked to the PCB for preventing the vehicle from exceeding the predetermined maximum velocity on a downhill.

9. A governor according to any one of the preceding claims, including a display unit for displaying the vehicle load.

10. A governor according to any one of the preceding claims wherein the various components of the governor are housed in protective casings.

11. A governor according to any one of the preceding claims, wherein the predetermined maximum velocity is reduced automatically after a predetermined time of uninterrupted travel.

12. A governor according to claim 11, wherein the reduction in the predetermined maximum velocity is incremental.
13. A governor according to any one of the preceding claims, wherein the predetermined maximum velocity is reduced automatically if the vehicle is not serviced within a predetermined time.

14. A method of governing a motor vehicle engine including the steps of:

   measuring changes in the load of a motor vehicle;

   computing a predetermined maximum velocity for the vehicle based on the vehicle load; and

   controlling rotation generated by the engine so that the engine is prevented from powering the vehicle to an actual velocity greater than the predetermined maximum velocity.

15. A method according to claim 14, wherein the step of measuring changes in the load of the vehicle includes measuring dimensional changes in the chassis of the vehicle with at least one strain gauge.

16. A method according to either claim 14 or claim 15, wherein the step of computing the predetermined maximum vehicle velocity is carried out by a program running on a microprocessor controlled printed-circuit board (PCB).

17. A method according to claim 16, wherein analogue signals representative of changes in the load of the vehicle are amplified, converted into digital signals and transmitted to the PCB.
18. A method according to either claim 16 or claim 17, wherein signals representative of the actual vehicle velocity are generated by a transducer and subsequently transmitted to the PCB.

19. A method according to either claim 16 or claim 17, wherein signals representative of the actual vehicle velocity are transmitted to the PCB from the vehicle speedometer.

20. A method according to any one of claims 16 to 19, wherein the program running on the PCB compares the actual velocity of the vehicle with the computed predetermined maximum vehicle velocity.

21. A method according to any one of claims 16 to 20, wherein the program running on the PCB regulates the rotation of the engine via an engine management system.

22. A method according to any one of claims 14 to 21, including the step of displaying the vehicle load on a display unit.

23. A method according to any one of claims 14 to 22, including the step of automatically reducing the predetermined maximum vehicle velocity after a predetermined time of uninterrupted travel.

24. A method according to any one of claims 14 to 23, including the step of automatically reducing the predetermined maximum vehicle velocity if the vehicle is not serviced within a predetermined time.

25. A method according to any one of claims 14 to 24, including the step of conducting at least one error check for detecting unauthorised
tampering with the governor.