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(19)

(54) A SPEED REGULATOR FOR INFLUENCING THE OPERATION OF A VEHICLE ENGINE

(71) We, ROBERT BOSCH GMBH, a German company of Postfach 50, 7000 Stuttgart 1, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention relates to a speed regulator for influencing the operation of a vehicle engine in accordance with a desired vehicle speed.

In accordance with the invention, such a speed regulator comprises an electric motor operable in accordance with the desired vehicle speed and arranged to drive an output member through a first reduction gear, an electromagnetic clutch comprising driving and driven elements, one element being fixed to the output member and the other element being mounted for rotation with respect to the output member, means for engaging and disengaging the electromagnetic clutch, means operatively connecting the driven element of the electromagnetic clutch to a member influencing the operation of the vehicle engine, and means for returning the said driven element to its zero position on disengagement of the electromagnetic clutch.

One advantage in using a rotary electromagnetic clutch, is that the length of the displacement path of the member influencing the operation of the engine, for example an accelerator lever, is not restricted as it is in using a "solenoid" or "tractive electromagnet" providing a relatively short longitudinal movement.

Another advantage which accrues from using a rotary electromagnetic clutch, is that a sufficiently large adjustment force can be applied to the said member through the reduction gear, with the aid of a relatively small electric motor.

The output member may be the output shaft of the first reduction gear. In that case, the element fixed to the output member preferably forms the driving element of the electromagnetic clutch and the element mounted for rotation with respect to the output member forms the driven element of the electromagnetic clutch and may also form part of a second reduction gear.

In such an arrangement, the electromagnetic clutch comprises an electromagnet and may also comprise an apertured disc forming the driving element of the electromagnetic clutch and engageable with the driven element of the electromagnetic clutch when the electromagnet is energised. In that case, the electromagnet may also be non-rotatable.

In another form of speed regulator in accordance with the invention, the element fixed to the output member forms the driving element of the electromagnetic clutch and the element mounted for rotation with respect to the output member forms the driving element of the electromagnetic clutch. In that case, the driving element of the electromagnetic clutch may form part of the first reduction gear.

The driving and driven elements of the electromagnetic clutch may be provided with teeth engageable by energising the electromagnet.

The electromagnet may be rotatable with the driven element of the electromagnetic clutch or may even form part of the said driven element. In that case, collector strips are provided for the supply of electric current to the electromagnet. Moreover, the driven element may be provided with a resistance strip co-operating with a fixed sliding contact for sensing the angular position of the said driven element.

The means for returning the driven element to its zero position preferably include a spring which may be arranged to act on the throttle pedal of a combustion engine.

Finally, the means operatively connecting the driven element of the electromagnetic clutch to the member for influencing the operation of the vehicle engine may comprise

a cable drum and a cable controlled by the cable drum, the cable being connected between the cable drum and the member for influencing the operation of a vehicle, for example the accelerator lever or throttle pedal of a combustion engine.

In order that the invention may be clearly understood and readily carried into effect, two embodiments of speed regulators in accordance therewith will now be described with reference to the accompanying drawings in which:

Figure 1 illustrates one form of speed regulator in which the electromagnet is non-rotatable; and

Figure 2 illustrates another form of speed regulator in which the electromagnet is rotatable.

A speed regulator which can be used for influencing the speed of a motor vehicle is shown in Figure 1. In order to maintain the speed of a vehicle substantially constant, the output from a device which compares the desired speed of the vehicle with the actual speed of the vehicle is used to operate the electric motor 10 driving the regulator.

If, for example, the driver of the motor vehicle actuates the clutch pedal of the motor vehicle in order to change gear, care must be taken that the regulator returns to its zero position since on sudden removal of a load, the motor speed will increase considerably and can reach an inadmissible value. The ability to return into the zero position automatically and as rapidly as possible on disengaging the clutch, the availability of a large regulating force and a large regulating path, are essential requirements of the regulator. In addition to the electric motor 10, the regulator has a first reduction gear 11. Such motors with reduction gears are used, for example, for driving windscreen wipers.

Through the reduction gear 11, the motor 10 drives an output shaft 12 on which is fixed an apertured disc 13 which rotates with the driven shaft 12 and forms the driving element of an electromagnetic clutch. A driven element 14 of the magnetic clutch and which is connected to a gear-wheel 15, is arranged coaxially with respect to the apertured disc 13 and is rotatably mounted on the output shaft 12. The gear-wheel 15 drives a worm-gear 16 on which is mounted a cable drum. The gear-wheel 15 and the worm-gear 16 together form a second reduction gear. The cable drum is operatively connected to the throttle pedal 18 of a combustion engine through a cable 17. Moreover, a compression spring 19 acts on the throttle pedal 18. The electromagnetic clutch formed by the apertured disc 13 and the driven element 14 can be engaged and disengaged by an electromagnet having a winding 20 which is non-rotable and can be connected to a supply of current through conductors 21 and 22.

When the winding 20 is not energised, the apertured disc 13 and the driven element 14 are urged apart, for example, by a corrugated spring washer. On the other hand, if the winding 20 is connected to a current supply the driven element 14 is attracted to the apertured disc 13 and is rotated with the latter. The rotary movement of the element 14 is transmitted through the gear-wheel 15 to the worm-gear 16 which adjusts the setting of the throttle pedal 18 through the cable drum and the cable 17. If the current supply is removed from the winding 20, for example when disengaging the clutch of the combustion engine, then the electromagnetic clutch becomes de-energised, the apertured disc 13 and the element 14 are urged apart and the compression spring 19 urges the throttle pedal 18 back into its zero position, whereupon the driven element 14 is also returned to its zero position through the cable 17, the worm-gear 16 and the gear-wheel 15 and if necessary with the assistance of a known spring arrangement, not shown, acting on the driven element 14.

Another form of speed regulator in accordance with the invention is illustrated in Figure 2. A hub 23 is positively connected to a driven element in the form of a disc 24 and is rigidly mounted on an output member in the form of a shaft 12'. The winding 20 is also mounted on the hub 23 and is rotatable together with the disc 24. A pole disc 26 and a worm-wheel 27 forming a driving element are mounted concentric with respect to the shaft 12', the worm-wheel 27 being driven by a worm 28. The disc 24 is provided with crown teeth 25 for engagement with the teeth on the worm-wheel 27 when the electromagnet is energised.

The winding 20, forming the essential part of the electromagnet, is arranged concentrically with respect to the worm-wheel 27 and the disc 24. The pole disc 26 and the worm-wheel 27 form the driving element of the electromagnetic clutch and the disc 24 forms the driven element of the electromagnetic clutch. The worm 28 and worm-wheel 27 form a first reduction gear. A second reduction gear, similar to that formed by the parts 15 and 16 in Figure 2, may be mounted on the output end of the shaft 12' so as to control a cable drum and cable arrangement for operating a throttle pedal 18, similar to that shown in Figure 1.

Between the driving disc 24 and the worm-wheel 27 there is arranged a corrugated spring-washer 29 which urges the worm-wheel 27 and the disc 24 apart. Collector strips 30 and 31 which serves for the current supply to the winding 20, are mounted on the end surface of the disc 24. The supply current for the winding 20 is supplied to the collector strips through sliding contacts 33 and 34, which are connectable to a source of current

through a switch controllable by the output from a device comparing desired and actual speeds of the vehicle. A fixed sliding contact 35 co-operating with a resistance strip 32 is provided for sensing the particular angular position of the disc 24 and with it that of the throttle pedal 18. The collector strips 30 and 31, the resistance strip 32, including the contacts 33 to 35, and the entire reduction gear and clutch parts, are protected against dirt by a seal 36.

In the operation of the regulator according to Figure 2, the output from a desired speed/actual speed comparing device is used to operate the motor driving the worm 28. When the winding 20 is disconnected from the current supply, the corrugated spring-washer 29 urges the two clutch elements 24 and 27 apart. The clutch is then brought into its zero position by the compression spring 19, the throttle pedal 18 and the cable 17 (see Figure 1). If a voltage is now applied to the winding 20, the pole disc 26 together with the worm-wheel 27 is attracted to the driving disc 24 against the force of the corrugated spring-washer 29, whereby the crown-teeth 25 on the disc 24 engage in the teeth on the worm-wheel 27, thus providing a power connection between the disc 24 and the worm-wheel 27. The rotation of the output shaft 12' is transmitted to the throttle pedal 18 and the particular angular position of the throttle pedal 18 or of the driving disc 24 can be sensed with the aid of the contact 35 and the resistance strip 32.

If, for example, during de-clutching of the combustion engine, the winding 20 is disconnected from the current supply, the corrugated spring-washer 29 urges the worm-wheel 27 and the disc 24 apart and the compression spring 19 urges the throttle pedal 18 and also the gear-wheel 27 into its zero position.

One advantage of the arrangement described lies in the fact that, during disengagement of the electromagnetic clutch by the speed comparing device, the member influencing the operation of the engine, in the present case the throttle pedal, moves automatically into its zero position, together with the driven element of the regulator, under the force of a compression spring. Another advantage lies in the fact that a relatively large regulating force can be applied by the regulator over a considerable range of adjustment.

If, during braking or accelerating of the vehicle, the power supply to the electric motor 10 and the winding 20 of the electromagnet is switched off, then the corrugated spring washer 29 urges the clutch elements 13, 14 or 26, 27, 24 apart and the driven element 14 or 24 returns to its zero position under the influence of the spring 19 or some other spring arrangement not illustrated in detail. During braking, the throttle pedal 18, having been released, is once more urged into its zero position by the spring 19. During acceleration, the driver overrides the regulator and resets the throttle pedal 18 against the force of the spring 19, in accordance with a desired speed different from that set at the speed comparison device.

WHAT WE CLAIM IS:—

1. A speed regulator for influencing the operation of a vehicle engine in accordance with a desired vehicle speed, comprising an electric motor operable in accordance with the desired vehicle speed and arranged to drive an output member through a first reduction gear, an electromagnetic clutch comprising driving and driven elements, one element being fixed to the output member and the other element being mounted for rotation with respect to the output member, means for engaging and disengaging the electromagnetic clutch, means operatively connecting the driven element of the electromagnetic clutch to a member influencing the operation of the vehicle engine, and means for returning the said driven element to its zero position on disengagement of the electromagnetic clutch.

2. A speed regulator according to claim 1, in which the output member is the output shaft of the first reduction gear.

3. A speed regulator according to claim 2, in which the element fixed to the output member forms the driving element of the electromagnetic clutch and the element mounted for rotation with respect to the output member forms the driven element of the electromagnetic clutch.

4. A speed regulator according to claim 3, in which the driven element of the electromagnetic clutch forms part of a second reduction gear.

5. A speed regulator according to claim 4, in which the means operatively connecting the driven element of the electromagnetic clutch to the member influencing the operation of the vehicle engine include the output gear-wheel of the second reduction gear.

6. A speed regulator according to any one of claims 1 to 5, in which the electromagnetic clutch comprises an electromagnet and an apertured disc forming the driving element of the electromagnetic clutch and engageable with the driven element of the electromagnetic clutch when the electromagnet is energised.

7. A speed regulator according to claim 6, in which the electromagnet is non-rotatable.

8. A speed regulator according to claim 1, in which the element fixed to the output member forms the driven element of the electromagnetic clutch and the element mounted for rotation with respect to the output member forms the driving element of the electromagnetic clutch.

9. A speed regulator according to claim

8, in which the driving element of the electromagnetic clutch forms part of the first reduction gear.

10. A speed regulator according to claim 9, in which the means operatively connecting the driven element of the electromagnetic clutch include the output member and the second reduction gear.

11. A speed regulator according to any one of claims 8 to 10 in which the driving and driven elements of the electromagnetic clutch are provided with teeth engageable by energising the electromagnet.

12. A speed regulator according to any one of claims 8 to 11, in which the electromagnet is arranged concentrically with respect to the driving and driven elements of the electromagnetic clutch and is rotatable with the said driven element.

13. A speed regulator according to claim 12, in which the electromagnet forms part of the said driven element.

14. A speed regulator according to claim 12 or claim 13, in which collector strips are provided for the supply of electric current to the electromagnet.

15. A speed regulator according to any one of claims 8 to 14, in which the driven element is provided with a resistance strip cooperating with a fixed sliding contact for sensing the angular position of the said driven element.

16. A speed regulator according to any preceding claim, in which the electromagnetic clutch comprises an electromagnet and the driving and driven elements of the electromagnetic clutch are urged apart by a spring when the electromagnet is not energised.

17. A speed regulator according to claim 16, in which the spring is a corrugated spring washer.

18. A speed regulator according to any preceding claim, in which the means operatively connecting the driven element of the electromagnetic clutch to the member for influencing the operation of the vehicle engine comprise a cable drum and a cable controlled by the cable drum.

19. A speed regulator according to claim 18, in which the cable is arranged to be connected between the cable drum and the accelerator lever or throttle pedal of a combustion engine.

20. A speed regulator according to any preceding claim in which the means for returning the driven element to its zero position on disengagement of the electromagnetic clutch, comprise a spring.

21. A speed regulator according to claim 20, in which the spring is arranged to act on the throttle pedal of a combustion engine.

22. A speed regulator for influencing the operation of a vehicle engine, substantially as herein described with reference to Figure 1 or Figure 2 of the accompanying drawings.

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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig.1

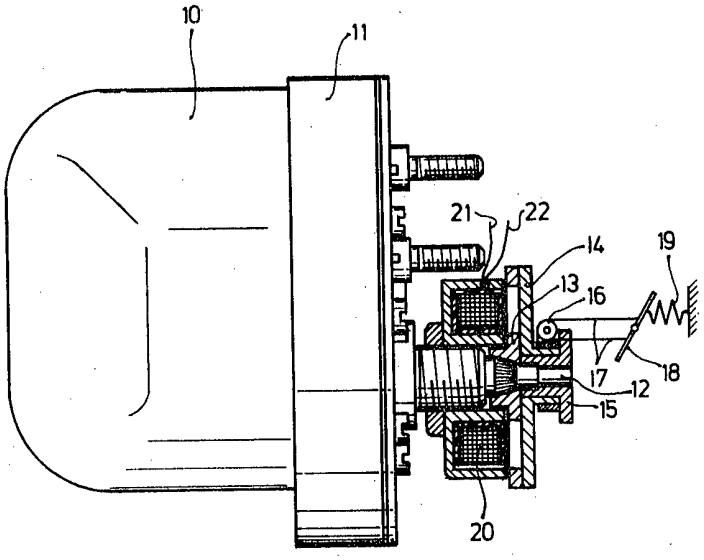

Fig.2