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(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.

The speed regulator of the present invention is an improvement in the speed regulator described and claimed in the Applicants' earlier Patent Application No. 30734/77 (Serial No. 1587083). Since it requires fewer parts, it is cheaper to produce and is less prone to breakdown.

A speed regulator in accordance with the present invention, comprises an electric motor operable in accordance with the desired vehicle speed, a gear train driveable by the electric motor and an electro-magnetic clutch comprising an electromagnet, a driving element and a driven element, the driven element being fixed to an output shaft arranged to vary the supply of fuel to the engine, the driving element being mounted for rotation with respect to the shaft and forming the output member of the gear train, in which an axially movable armature is arranged on the driving element, the energising coil of the electromagnet is non-rotatable and concentrically arranged with respect to the output shaft and the driven element is a magnetic flux conducting ring extending between the energising coil and the armature.

The driving element is preferably made of non-magnetic material, such as a plastics material. The armature may be resiliently connected to the driving element, for example by leaf springs which may be integral with the driving element.

The armature may comprise one or more plate-like elements, if desired, provided with friction elements.

The output shaft is preferably arranged to drive a potentiometer for influencing the operation of the electric motor. The potentiometer may be connected to the output shaft by an axial coupling which may be designed to compensate for any misalignment between the output shaft and the adjustment shaft of the potentiometer. To this end, the axial coupling may comprise a rubber elastic material.

The gear train is preferably formed by a worm driveable by the electric motor and meshing with teeth on the driving element.

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

Figure 1 is a cross-section through one form of speed regulator;

Figure 2 is a section taken on the line II–II in Figure 1;

Figure 3 is a partial section taken on the line III–III in Figure 1; and

Figure 4 is a cross-section through another form of speed regulator.

The speed regulators shown in the drawings are designed for use in conjunction with a device which compares the actual and desired speeds of a vehicle and provides an output signal, representative of the difference between the actual and desired speeds, for operating the speed regulator motor. It also provides a signal for controlling the current supply to the electromagnetic clutch for engagement and disengagement of the electromagnetic clutch.

The speed regulator shown in Figures 1 to 3 of the drawings comprises an electric motor 1 (Figure 2) and a gear train 2. The electric motor 1 is arranged in a housing 3 which is fixed by bolts 4 to a housing 5 accommodating the gear train. The gear train comprises a worm 7 mounted on the shaft 6 of the motor 2 and a wormwheel 8, the worm 7 meshing with teeth

formed around the periphery of the worm-wheel 8.

The regulator is also provided with an electro-magnetic clutch 10 comprising an electromagnet, a driving element formed by the worm-wheel 8 and a driven element 18. The element 18 is fixed to an output shaft 9 which is arranged to vary the supply of fuel to the vehicle engine through means which will be described later. The worm-wheel 8 is rotatably mounted on the shaft 9 and forms both the output member of the gear train and the driving element of the clutch 10.

An armature 13, axially movable with respect to the shaft 9, is arranged on the worm-wheel 8. The armature 13 comprises two plate-like rings which, in this embodiment, (see Figure 3), are fixed by spot welds 14 to the free ends of leaf springs 11 attached to the worm-wheel 8 by rivets 12. Thus, the worm-wheel 8 and the armature 13 are combined to form a unitary component, the armature being resiliently connected to the driving element of the clutch 10 by the leaf springs 11.

The electromagnet comprises a non-rotatable energising coil 16 which is concentrically arranged with respect to the shaft 9, mounted in a carrier 15 of plastics material held in a cover 17 of the housing 5. The driven element 18 of the clutch 10 is a magnetic flux conducting ring extending between the energising coil 16 and the armature 13.

The worm-wheel 8 may be made entirely of plastics material or of metal. Alternatively, it may be made of plastics material with metal teeth. When made entirely or partly of plastics material, the leaf springs 11 may also be of plastics material and formed integrally with worm-wheel itself. Likewise, the cover 17 may be made of plastics material and is preferably a tight fit at 17′ in an opening in the housing 5.

The means through which the output shaft 9 can vary the supply of fuel to the vehicle engine comprise a pulley 19 (shown dotted) fixed to the free end of the shaft 9 and a cable 20 (also shown dotted) connecting the pulley 19 to a fuel control lever 21, such as the accelerator pedal of the vehicle. The lever 21 is moved, by the driver of the vehicle, against the force of a spring 22 which attempts to urge the lever 21 back into its zero position. As in the parent Application No. 30734/77, (Serial No. 1587083), this arrangement is used to return the regulator to its zero position when, for example, the driver of the vehicle actuates the vehicle clutch pedal for the purpose of changing gear. Without the provision of the spring 22 acting on the regulator through the cable 20, the pulley 19 and the shaft 9, the speed of the engine would increase considerably when the vehicle clutch is depressed and could reach an inadmissible value. As it is, the current supply to the coil 16 is cut-off when the driver depresses the clutch pedal so that the leaf springs 11 can disengage the electromagnetic clutch to allow the spring 22 to urge the lever 21 back into its zero position together with the shaft 9 and the driven element 18.

The output shaft 9 is arranged to drive a potentiometer 23 situated beyond the end of the shaft 9 remote from the pulley 19. The potentiometer 23 influences the operation of the motor 1 by signalling the angular position of the shaft 9 and the position of the lever 21, to the actual and desired speeds comparing device the output of which is used to operate the motor 1. An axial coupling 24, consisting of a rubber elastic material, connects the shaft 9 to the adjustment shaft of the potentiometer 23 to compensate for any misalignment between the shaft 9 and the potentiometer 23.

The speed regulator is enclosed in a housing 25 made of plastics material and which can be fixed to the motor vehicle by means of bolts screwed into threaded bores 26. The end of the shaft 9 on which the pulley 19 is mounted projects out of the housing 25 so that the cable 20 can operate freely.

When the coil 16 receives energising current in response to a signal from the speed comparing device, the armature 13 is attracted axially towards the flux conducting ring 18 against the force of the leaf springs 11. Since the armature 13 is provided with friction elements, the ring 18 is frictionally connected to the worm-wheel 8 and the clutch 10 becomes engaged. The output shaft 9 is then rotated through a particular angle by the operation of the motor 1, also receiving its signal from the speed comparing device, and the lever 31 is moved to an appropriate position. This varies the supply of fuel to the vehicle engine until it is operating to drive the vehicle at the desired speed. When the desired set speed is reached, the potentiometer 23 signals the position of the lever 21 to the speed comparing device which then switches-off the motor 1.

The speed regulator shown in Figure 4 is very similar to that illustrated in Figures 1 to 3. However, it differs by the fact that its electromagnetic clutch 30, corresponding to the clutch 10 of the Figure 1 arrangement, is held in a gear housing 35 and not in a cover corresponding to the cover 17 of Figure 1.

The clutch 30 has an energising coil 36 non-rotatably held in a carrier fixed in the gear housing 35. The clutch 30 comprises a flux conducting ring 38 and a worm-wheel 39 carrying an armature 33. The ring 38 is fixed to an output shaft 40 and forms the driven element of the clutch 30 whereas the wheel 39 is mounted for rotation with respect to the shaft 40 and forms the driving element of the clutch 30. Once again the driven element or ring 38 extends between the coil 36 and the armature 33.

Whether the regulator of Figures 1 to 3 or that of Figure 4 is used will depend on the construction of the vehicle and/or of the engine on which it is to be used.

As with the regulators of the parent applica-

tion, the regulators of the present invention also provide a relatively large regulating force over a considerable range of adjustment. However, they have the advantage that they include fewer parts and are therefore cheaper to produce and are less liable to breakdowns.

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, a gear train driveable by the electric motor and an electromagnetic clutch comprising an electromagnet, a driving element and a driven element, the driven element being fixed to an output shaft arranged to vary the supply of fuel to the engine, the driving element being mounted for rotation with respect to the shaft and forming the output member of the gear train, in which an axially movable armature is arranged on the driving element, the energising coil of the electromagnet is non-rotatable and concentrically arranged with respect to the output shaft and the driven element is a magnetic flux conducting ring extending between the energising coil and the armature.

2. A speed regulator according to claim 1, in which the driving element is made of non-magnetic material.

3. A speed regulator according to claim 2, in which the non-magnetic material is a plastics material.

4. A speed regulator according to any one of claims 1 to 3, in which the armature is resiliently connected to the driving element.

5. A speed regulator according to claim 4, in which the armature is connected to the driving element by leaf springs.

6. A speed regulator according to claim 5, in which the leaf springs are integral with the driving element.

7. A speed regulator according to any preceding claim, in which the armature comprises one or more plate-like members provided with friction elements.

8. A speed regulator according to any preceding claim, in which the output shaft is arranged to drive a potentiometer for influencing the operation of the electric motor.

9. A speed regulator according to claim 8, in which the potentiometer is connected to the output shaft by an axial coupling.

10. A speed regulator according to claim 9, in which the axial coupling is designed to compensate for any misalignment between the output shaft and the potentiometer adjustment shaft.

11. A speed regulator according to claim 10, in which the axial coupling comprises a rubber elastic material.

12. A speed regulator according to any preceding claim, in which the gear train is formed by a worm drivable by the electric motor and meshing with teeth on the driving element.

13. A speed regulator for influencing the operation of a vehicle engine, substantially as herein described with reference to Figures 1 to 3 or Figure 4 of the accompanying drawings.

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1588255 COMPLETE SPECIFICATION

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Sheet 1

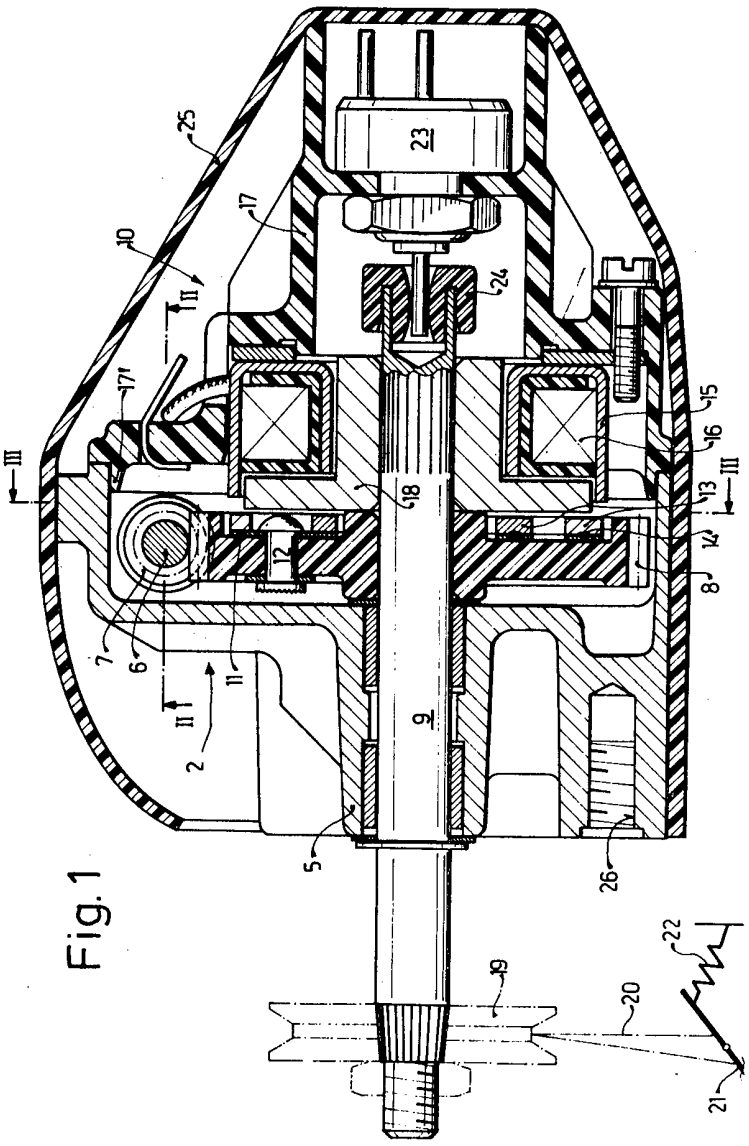


Fig. 1

Fig. 2

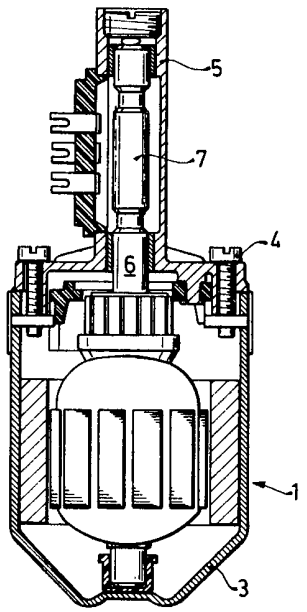
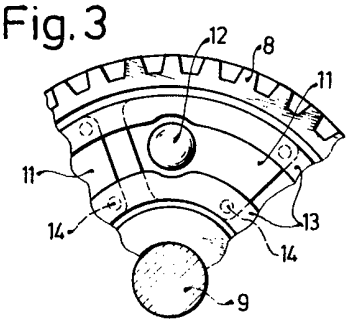


Fig. 3



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Sheet 3

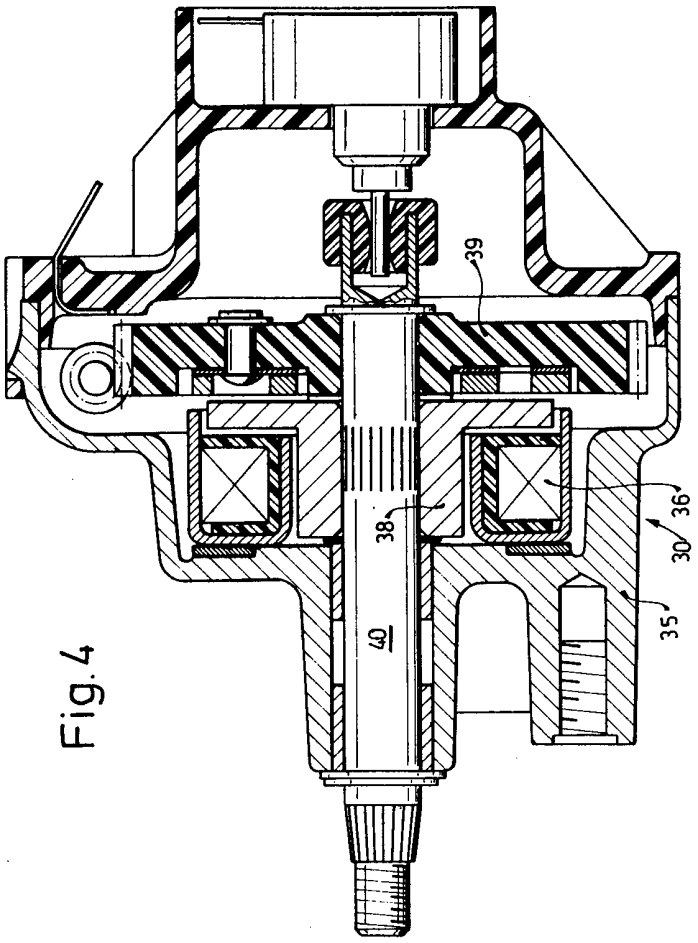

Fig.4