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(54) **FUEL SUPPLY-REGULATING DEVICE FOR A VEHICLE**

(57) An automatic fuel supply adjusting device for motor vehicles comprises a driving speed sensor (SV), a driving state sensor (SS), a gas pedal sensor (9) and a control unit (8) for controlling the amount of fuel supply, the gas pedal sensor (9), the driving speed sensor (SV) and the driving state sensor (SS) being coupled with the control unit (8), wherein the operation state of the control unit (8) of the automatic fuel supply adjusting device is so controlled according to a signal detected by the gas pedal sensor (9), that the engine is supplied with fuel in the normal state or with fuel at idle speed. In the case where the gas pedal is kept in an advanced position and the engine is supplied with fuel in the normal state for so long time that the motor vehicle reaches a constant-speed state, then the control unit (8) enables to supply the engine with fuel in the normal state and with fuel at idle speed alternatively under a preset speed difference value.

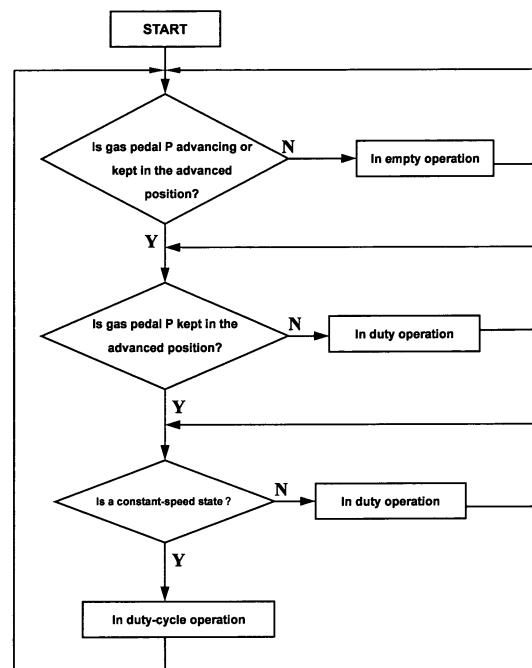


Fig.1

Description

Technical Field

[0001] This invention relates to an automatic fuel supply adjusting device for motor vehicles.

Background Art

[0002] It's well-known that motor vehicles only consume fuel at idle speed when it glides at the neutral gear. In this case, the acceleration, deceleration and constant-speed drive of the motor vehicles comply with the following Newton's law of motion:

$$F = ma \quad (1)$$

$$V_t = at + V_0 \quad (2)$$

$$V_t^2 - V_0^2 = 2aS \quad (3)$$

$$S = V_0t + at^2/2 \quad (4)$$

Wherein "m" indicates the mass of the motor vehicle, " V_0 " indicates the initial velocity, " V_t " indicates the final velocity, "t" indicates the driving duration time from the speed V_0 to the speed V_t , "a" indicates the acceleration, and "S" indicates the driving distance in the driving duration time t.

[0003] The formula $S = V_0t + at^2/2$ can be transformed into $S - V_0t = at^2/2$. For facilitating calculation and making a conclusion, the driving distance of the motor vehicle in the process of accelerating drive with an initial velocity V_0 and with a driving duration time t can be divided into two portions intendedly, one of which is defined as a distance portion resulted from the initial velocity and is equal to V_0t , and the other portion is defined as a distance portion resulted from the acceleration and is equal to $S - V_0t$. The relation of the acceleration, the traction force and the distance portion resulted from the acceleration is analyzed as below. The motor vehicle under the acceleration a drives over a total driving distance S, and the distance portion resulted from the acceleration is equal to $S - V_0t$. The motor vehicle under the acceleration na and under the initial velocity V_0 drives over a total driving distance S_n , and the distance portion resulted from the acceleration is equal to $S_n - V_0t$. The ratio of the two distance portions resulted from the acceleration is calculated as below:

$$(S_n - V_0t)/(S - V_0t) = n \quad (5)$$

[0004] It can be seen from the formula $F = ma$, there is a linear relation between the traction force and the acceleration. If the traction force is enhanced to n factors, then the acceleration is also enhanced to n factors, and thus the distance portion resulted from the acceleration is also enhanced to n factors. It can be regarded under the same gear approximately, when the traction force is enhanced to n factors, the fuel consumption is also enhanced to n factors. The above mentioned formulas are also suitable for a constant-speed state of the motor vehicle, since the constant-speed state can be regarded as a state with an infinitesimal acceleration.

[0005] At present, the output power of the engines of all the motor vehicles can be adjusted by the operation of the drivers to the gas pedal. In the process of driving the motor vehicle, an experienced driver can spare fuel by releasing the gas pedal intendedly in a short time, so that the motor vehicle lies in a gliding state in this short time. However, repeated releases of the gas pedal by means of manual operation in the process of driving make the driver very tired on one side, and the optimal time of releasing the gas pedal is very difficult to grasp by the driver on the other hand, thus an optimal reduction of fuel consumption can't be reached.

Summary of Invention

[0006] The object of the present invention is to provide an automatic fuel supply adjusting device, by means of which the fuel supply to the engine is adjusted in a preset manner, so that a spare of fuel consumption is reached.

[0007] According to the present invention, a constant-speed driving is changed into acceleration driving portions with a small acceleration and gliding driving portions. It can be seen from the above analysis that under the same fuel consumption the constant-speed driving and the acceleration driving don't result in loss of the driving distance, and only fuel at idle speed is consumed during the gliding driving. Thus a spare of fuel consumption is reached.

[0008] To achieve this object, the present invention provides an automatic fuel supply adjusting device for motor vehicles, comprising a driving speed sensor, a driving state sensor and a gas pedal sensor, characterized in that the automatic fuel supply adjusting device further comprises a duty-cycle unit, with which the gas pedal sensor, the driving speed sensor and the driving state sensor are coupled, wherein

a) In the case where the gas pedal sensor senses that the gas pedal is advancing, the duty-cycle unit works in the duty operation, so that the fuel supply line is switched on, and thus the engine is supplied with fuel;

b) In the case where the gas pedal sensor senses that the gas pedal is kept in the advanced position, the duty-cycle unit works in the duty operation, until

the driving state sensor senses that the motor vehicle reaches a constant-speed state, then the duty-cycle unit works in the duty-cycle operation under a preset speed difference value, that is to say, a duty operation and an empty operation are carried out alternatively; and

c) In the case where the gas pedal sensor senses that the gas pedal is returning or is kept in the returned position, the duty-cycle unit works in the empty operation, so that the fuel supply line is cut off, and thus the engine is supplied with only fuel at idle speed.

[0009] An important function of the driving speed sensor is to measure the speed change of the motor vehicle during the empty operation of the duty-cycle unit continuously. When the amount of the speed change reaches a preset speed difference value, which can be preset by operating a rotation button in the driver's cab by the driver, an empty operation is changed into a duty operation or vice versa, and thus round and round.

[0010] In the present invention, the duty operation of the fuel supply of the engine means that the duty-cycle unit of the automatic fuel supply adjusting device according to the present invention doesn't intervene in the fuel supply system of the engine, so that the fuel supply system can provide the engine with fuel determined by the gas pedal position; the empty operation of the fuel supply of the engine means that the duty-cycle unit of the automatic fuel supply adjusting device according to the present invention enables to provide the engine with fuel only necessary for holding the idle speed; and the duty-cycle operation of the fuel supply of the engine means that an empty operation and a duty operation run alternatively. The duty-cycle unit of the automatic fuel supply adjusting device according to the present invention doesn't intervene in the fuel supply of the engine in the duty operation of the duty-cycle operation, while in the empty operation of the duty-cycle operation it enables to provide the engine with fuel only necessary for holding the idle speed.

[0011] According to a preferable embodiment of the present invention, the duty-cycle unit can be an electromagnetic fuel supply line throttle arranged in the fuel supply line. In an engine with an electrical control injection system, the duty-cycle unit can be a control device for controlling the fuel injecting amount of the electrical control injection system.

[0012] According to a preferable embodiment of the present invention, the automatic fuel supply adjusting device comprises an electrical control clutch which is arranged downstream of the engine in the drive line and coupled with the duty-cycle unit operationally, wherein in the case where the duty-cycle unit works in the duty operation, the electrical control clutch is closed, while in the case where the duty-cycle unit works in the empty operation, the electrical control clutch is released. By this

measurement, the fuel consumption is further reduced. The electrical control clutch is preferably arranged in a last-stage drive shaft in the drive line.

[0013] It's advantageous, when the duty-cycle unit works in the duty-cycle operation, it works in the empty operation at first, until the descending amount of the speed of the motor vehicle reaches a preset speed difference value, and then it works in the duty operation, until the driving state sensor senses that the motor vehicle reaches a constant-speed state, and then it works in the next cycle of the duty-cycle operation.

[0014] It's also advantageous, when the duty-cycle unit reaches the duty-cycle operation, it works in the duty operation at first and thus the engine is supplied with fuel more than the normal state for acceleration, until the ascending amount of the speed of the motor vehicle reaches a preset speed difference value, and then it works in the empty operation, until the descending amount of the speed of the motor vehicle reaches the preset speed difference value, wherein in this period only fuel necessary for holding the idle speed is supplied, and then it works in the next cycle of the duty-cycle operation.

[0015] The preset speed difference value can be preset by the driver by use of a rotation button arranged in the driver's cab. The preset speed difference value lies in the range between 0 and 50 km/h, preferably between 5 and 20 km/h. When the speed difference value is preset as 0 km/h, it means that the motor vehicle should run in the duty operation continuously.

[0016] When the gas pedal advances to a certain extent, normally to a position of no less than 70% of the whole displacement of the gas pedal, it means that the driver hopes that the engine outputs a big torque and doesn't require a high economic performance. In this case, the duty-cycle unit works in the duty operation.

[0017] The present invention provides also an automatic fuel supply adjusting device for motor vehicles, comprising a driving speed sensor, a driving state sensor and a gas pedal sensor, characterized in that the automatic fuel supply adjusting device further comprises a duty-cycle unit, with which the gas pedal sensor, the driving speed sensor and the driving state sensor are coupled, wherein

a) In the case where the gas pedal sensor senses that the gas pedal is advancing or returning, the duty-cycle unit works in the duty operation, that is to say, the duty-cycle unit doesn't intervene in the fuel supply of the engine; and

b) In the case where the gas pedal sensor senses that the gas pedal is kept in the advanced position or in the returned position, the duty-cycle unit works in the duty operation, until the driving state sensor senses that the motor vehicle reaches a constant-speed state, and then the duty-cycle unit works in the duty-cycle operation under a preset speed difference value, that is to say, a duty operation and an

empty operation are carried out alternatively.

[0018] In the case where the motor vehicle works in the duty-cycle operation by use of the automatic fuel supply adjusting device according to the present invention, in a cycle of the duty-cycle operation, both the duty time and the empty time are variable. Since various motor vehicles have various acceleration performances, for motor vehicles with various performances, their duty-cycle ratio, that is to say, a ratio between the duty time and the empty time, is different.

Brief Description of the Drawings

[0019] The present invention is explained below with the aid of the drawings. They show:

- Fig. 1 A control logic diagram of an automatic fuel supply adjusting device according to the present invention, 20
- Fig. 2 A control logic diagram of a duty-cycle operation of a duty-cycle unit according to an embodiment of the present invention, 25
- Fig. 3 A control logic diagram of a duty-cycle operation of a duty-cycle 30
- Fig. 4 unit according to another embodiment of the present invention, An embodiment of an automatic fuel supply adjusting device according to the present invention schematically, 35
- Fig. 5 Another embodiment of an automatic fuel supply adjusting device according to the present invention schematically, 40
- Fig. 6 Another embodiment of an automatic fuel supply adjusting device according to the present invention schematically, 45
- Figs. 7a - 7c A group of schematic figures illustrating the gas pedal position, the operation state of the duty-cycle unit and the driving speed of a motor vehicle equipped with an automatic fuel supply adjusting device according to the present invention. 50

Detailed Description of Preferable Embodiments

[0020] The automatic fuel supply adjusting device for motor vehicles according to the present invention comprises a driving speed sensor, a driving state sensor SS, a gas pedal sensor 9 and a duty-cycle unit 8, and the driving speed sensor, the driving state sensor SS and

the gas pedal sensor are coupled with the duty-cycle unit 8. If necessary, the automatic fuel supply adjusting device further comprises an electrical control clutch 7 which is arranged downstream of the engine and is coupled with the duty-cycle unit 8 operationally, wherein the electrical control clutch 7 is closed when the duty-cycle unit 8 works in the duty operation, and is released when the duty-cycle unit 8 works in the empty operation.

Figure 1 shows a control logic diagram of the automatic fuel supply adjusting device according to the present invention. In the case where the gas pedal sensor 9 senses that the gas pedal P is advancing, the duty-cycle unit 8 works in the duty operation and the fuel supply line is switched on and thus the engine is supplied with fuel; in the case where the gas pedal sensor 9 senses that the gas pedal P is kept in the advanced position, the duty-cycle unit 8 works in the duty operation, until the driving state sensor SS senses that the motor vehicle reaches a state of constant speed, then the duty-cycle unit 8 works in the duty-cycle operation under a preset speed difference value; and in the case where the gas pedal sensor 9 senses that the gas pedal is returning or is kept in the returned position, the duty-cycle unit 8 works in the empty operation, and thus the fuel supply line is cut off, so that the engine is supplied with fuel at idle speed.

Figure 2 shows a preferable operation model of the duty-cycle unit 8 according to the present invention after it reaches the duty-cycle operation. The duty-cycle unit 8 works in the empty operation at first, so that the engine is only supplied with fuel at idle speed, until the descending amount of the speed of the vehicle reaches a preset speed difference value, then the duty-cycle unit 8 works in the duty operation, so that the engine is supplied with fuel for acceleration, until the driving state sensor SS senses that the motor vehicle reaches a constant-speed state, and then the duty-cycle unit works in the empty operation again, that is to say, it works in the next cycle of the duty-cycle operation.

Figure 3 shows another preferable operation model of the duty-cycle unit 8 according to the present invention after it reaches the duty-cycle operation. When the duty-cycle unit 8 reaches the duty-cycle operation, the duty-cycle unit 8 works in the duty operation at first, so that the engine is supplied with fuel more than the normal state for acceleration, until the ascending amount of the speed of the vehicle reaches a preset speed difference value, then the duty-cycle unit 8 works in the empty operation, so that the engine is only supplied with fuel at idle speed, until the descending amount of the speed of the motor vehicle reaches the preset speed difference value, and then it works in the next cycle of the duty-

cycle operation.

Figure 4 shows an embodiment of the automatic fuel supply adjusting device. The gas pedal sensor 9 is designed as a slide rheostat F, a slide end B of which is driven by the gas pedal P. The electrical resistance output from the two ends A, B of the slide rheostat F depends on the position of the gas pedal. In the case where the gas pedal P is advancing, the electrical resistance descends continuously, and in the case where the gas pedal is returning, the electrical resistance ascends continuously, or vice versa. According to the change of the electrical resistance and by the aid of an electrical circuit Ci the advancing state of the gas pedal, the returning state of the gas pedal, the state of the gas pedal kept in the advanced position, the state of the gas pedal kept in the returned position and the like states can be identified. In the case where the gas pedal is located in a position of 70 - 100% of its whole displacement, the electrical resistance falls into a specific range, and this state can also be identified naturally. The gas pedal sensor 9, the driving speed sensor SV and the driving state sensor SS are coupled with the duty-cycle unit 8 and the eventual electrical control clutch 7 via the electrical circuit Ci.

Figure 5 shows another embodiment of the automatic fuel supply adjusting device. The gas pedal sensor 9 is designed as a direct current generator which is arranged on the rotation shaft N of the gas pedal P, wherein the sign "K" represents the rotor of the generator, the sign "E" represents the stator of the generator, the signs "A'" and "B'" represent the output lines. In the case where the gas pedal is advancing, a positive voltage is output, wherein the output line A' is the positive pole and the output line B' is the negative pole or vice versa. In the case where the gas pedal is returning, a negative voltage is output, wherein the output line A' is the negative pole and the output line B' is the positive pole or vice versa. The size of the output voltage depends on the size of the speed of the operated gas pedal P. According to the output voltage and by the aid of an electrical circuit Ci the advancing state of the gas pedal, the returning state of the gas pedal, the state of the gas pedal kept in the advanced position, the state of the gas pedal kept in the returned position and the like states can be identified. The gas pedal sensor 9, the driving speed sensor SV and the driving state sensor SS are coupled with the duty-cycle unit 8 and the eventual electrical control clutch 7 via the electrical circuit Ci.

Figure 6 shows another embodiment of the control logic diagram of the automatic fuel supply adjusting device according to the present invention. In the case where the gas pedal sensor 9 senses that the gas

pedal P is advancing or returning, the duty-cycle unit 8 works in the duty operation, that is to say, the duty-cycle unit 8 doesn't intervene in the fuel supply of the engine. In the case where the gas pedal sensor 9 senses that the gas pedal P is kept in the advanced position or in the returned position, the duty-cycle unit 8 works in the duty operation, until the driving state sensor SS senses that the motor vehicle reaches a constant-speed state, then the duty-cycle unit 8 works in the duty-cycle operation under a preset speed difference value, that is to say, a duty operation and an empty operation are carried out alternatively.

Figures 7a - 7c show a group of schematic figures illustrating the position of the gas pedal, the operation state of the duty-cycle unit 8 and the speed of the motor vehicle which is equipped with the automatic fuel supply adjusting device according to the present invention. Figure 7a shows the position of the gas pedal P schematically, figure 7b shows the operation state of the duty-cycle unit 8 schematically, wherein the numeral "1" represents the duty operation and the numeral "0" represents the empty operation, as well as figure 7c shows the speed of the motor vehicle schematically. It can be seen from figure 7, in the case where the motor vehicle reaches a constant-speed state, the duty-cycle unit 8 begins to work in the duty-cycle operation, and the speed of the motor vehicle lies between a maximal speed $V_{\max}$ and a minimal speed $V_{\min}$, wherein the speed difference value between the maximal speed $V_{\max}$ and the minimal speed $V_{\min}$ is determined by a preset speed difference value.

[0021] Experimental data of a motor vehicle are shown as below. This motor vehicle weights 2.5 tons, and the adjustable range of the power of the engine lies between 0-200 horse power (1 horse power = 735 watt). The motor vehicle is five-speed. When the motor vehicle is driven stably with a speed of 80 km/h on the road, the fuel consumption is 15 liter per 100 kilometer. By use of the automatic fuel supply adjusting device according to the present invention, wherein the speed difference value is preset as 5 km/h manually by the driver and the gas pedal is operated to a certain position so that the motor vehicle runs with a speed between 77.5 km/h and 82.5 km/h, the gliding distance of the motor vehicle is $S = 131.5\text{m}$ according to the following formulas:

$$S = V_0 t + at^2/2,$$

$$t = (V_t - V_0)/a,$$

wherein $V_t = 77.5 \text{ km/h}$, $V_0 = 82.5 \text{ km/h}$, $F = 10\% \text{ mg}$ ("g"

represents the acceleration of the gravity and is equal to about $9.8) = 2450000 \text{ N}$, $m = 2500 \text{ kg}$, $a = 0.98 \text{ m/s}^2$, $t = 5.1 \text{ s}$. In this gliding distance the motor vehicle only consumes fuel at idle speed. The above-mentioned formulas are also suitable for the duty operation, wherein the traction distance is also 131.5 m and the time lasts 5.1 s . In this distance, the fuel consumption is enhanced 50% for accelerating. As a result, the saving ratio of the fuel consumption is $2/1.5 - 1 = 0.33 \text{ (33\%)}$.

[0022] Thus it can be seen that the fuel consumption is reduced since the motor vehicle obtains a certain gliding distance. As the motor vehicle is driven at a speed lower than the designed speed upper limit in most driving states, in the driving process of the motor vehicle according to the present invention at the speed lower than this speed upper limit, a spare ration of fuel consumption of $10 - 35\%$ can be realized.

Claims

1. An automatic fuel supply adjusting device for motor vehicles, comprising a driving speed sensor (SV), a driving state sensor (SS) and a gas pedal sensor (9), **characterized in that** the automatic fuel supply adjusting device further comprises a duty-cycle unit (8), with which the gas pedal sensor (9), the driving speed sensor (SV) and the driving state sensor (SS) are coupled, wherein

a) In the case where the gas pedal sensor (9) senses that the gas pedal is advancing, the duty-cycle unit (8) works in the duty operation, so that the fuel supply line is switched on, and thus the engine is supplied with fuel;

b) In the case where the gas pedal sensor (9) senses that the gas pedal (P) is kept in the advanced position, the duty-cycle unit (8) works in duty operation, until the driving state sensor (SS) senses that the motor vehicle reaches a constant-speed state, then the duty-cycle unit (8) works in the duty-cycle operation under a preset speed difference value, that is to say, a duty operation and an empty operation are carried out alternatively; and

c) In the case where the gas pedal sensor (9) senses that the gas pedal is returning or is kept in the returned position, the duty-cycle unit (8) works in the empty operation, so that the fuel supply line is cut off, and thus the engine is supplied with fuel at idle speed.

2. The automatic fuel supply adjusting device according to claim 1, **characterized in that** the automatic fuel supply adjusting device comprises an electrical control clutch (7) which is arranged downstream of the engine in the drive line and is coupled with the duty-cycle unit (8) operationally, wherein in the case

where the duty-cycle unit (8) works in the duty operation, the electrical control clutch (7) is closed, while in the case where the duty-cycle unit (8) works in the empty operation, the electrical control clutch (7) is released.

3. The automatic fuel supply adjusting device according to claim 1 or 2, **characterized in that** when the duty-cycle (8) reaches the duty-cycle operation, it works in the empty operation at first, until the descending amount of the speed of the motor vehicle reaches a preset speed difference value, and then it works in the duty operation, until the driving state sensor (SS) senses that the motor vehicle reaches a constant-speed state, and then it works in the next cycle of the duty-cycle operation.

4. The automatic fuel supply adjusting device according to claim 1 or 2, **characterized in that** when the duty-cycle unit (8) reaches the duty-cycle operation, it works in the duty operation at first and thus the engine is supplied with fuel more than the normal state for acceleration, until the ascending amount of the speed of the motor vehicle reaches a preset speed difference value, and then it works in the empty operation, thus the engine is supplied with fuel at idle speed, until the descending amount of the speed of the motor vehicle reaches the preset speed difference value, and then it works in the next cycle of the duty-cycle operation.

5. The automatic fuel supply adjusting device according to claim 1 or 2, **characterized in that** the preset speed difference value is preset by the driver by use of a rotation button arranged in the driver's cab.

6. The automatic fuel supply adjusting device according to claim 1 or 2, **characterized in that** the preset speed difference value lies in the range between 0 and 50 km/h .

7. The automatic fuel supply adjusting device according to claim 6, **characterized in that** the preset speed difference value lies in the range between 5 and 20 km/h .

8. The automatic fuel supply adjusting device according to claim 1 or 2, **characterized in that** the duty-cycle unit (8) works in the duty operation when the position of the gas pedal (P) reaches 70% of the whole displacement of the gas pedal or exceeds this value.

9. The automatic fuel supply adjusting device according to claim 2, **characterized in that** the electrical control clutch (7) is arranged in a last-stage drive shaft in the drive line.

10. The automatic fuel supply adjusting device according to claim 1 or 2, **characterized in that** the duty-cycle unit (8) is an electromagnetic fuel supply line throttle arranged in the fuel supply line.

11. The automatic fuel supply adjusting device according to claim 1 or 2, **characterized in that** the duty-cycle unit (8) is a control device for controlling the injecting amount of the electrical control injection system.

12. An automatic fuel supply adjusting device for motor vehicles, comprising a driving speed sensor (SV), a driving state sensor (SS) and a gas pedal sensor (9), **characterized in that** the automatic fuel supply adjusting device further comprises a duty-cycle unit (8), with which the gas pedal sensor, the driving speed sensor (SV) and the driving state sensor (SS) are coupled, wherein

a) In the case where the gas pedal sensor (9) senses that the gas pedal (P) is advancing or returning, the duty-cycle unit (8) works in the duty operation, that is to say, the duty-cycle unit (8) doesn't intervene in the fuel supply of the engine; and

b) In the case where the gas pedal sensor (9) senses that the gas pedal (P) is kept in the advanced position or in the returned position, the duty-cycle unit (8) works in the duty operation, until the driving state sensor (SS) senses that the motor vehicle reaches a constant-speed state, and then the duty-cycle unit (8) works in the duty-cycle operation under a preset speed difference value, that is to say, a duty operation and an empty operation are carried out alternatively.

13. The automatic fuel supply adjusting device according to claim 12, **characterized in that** the automatic fuel supply adjusting device comprises an electrical control clutch (7) which is arranged downstream of the engine in the drive line and is coupled with the duty-cycle unit (8) operationally, wherein in the case where the duty-cycle unit (8) works in the duty operation, the electrical control clutch (7) is closed, while in the case where the duty-cycle unit (8) works in the empty operation, the electrical control clutch (7) is released.

14. The automatic fuel supply adjusting device according to claim 12 or 13, **characterized in that** when the duty-cycle (8) reaches the duty-cycle operation, it works in the empty operation at first, until the descending amount of the speed of the motor vehicle reaches a preset speed difference value, and then it works in the duty operation, until the driving state sensor (SS) senses that the motor vehicle reaches

a constant-speed state, and then it works in the next cycle of the duty-cycle operation.

15. The automatic fuel supply adjusting device according to claim 12 or 13, **characterized in that** when the duty-cycle unit (8) reaches the duty-cycle operation, it works in the duty operation at first and thus the engine is supplied with fuel more than the normal state for acceleration, until the ascending amount of the speed of the motor vehicle reaches a preset speed difference value, and then it works in the empty operation, thus the engine is supplied with fuel at idle speed, until the descending amount of the speed of the motor vehicle reaches the preset speed difference value, and then it works in the next cycle of the duty-cycle operation.

16. The automatic fuel supply adjusting device according to claim 12 or 13, **characterized in that** the preset speed difference value is preset by the driver by use of a rotation button arranged in the driver's cab.

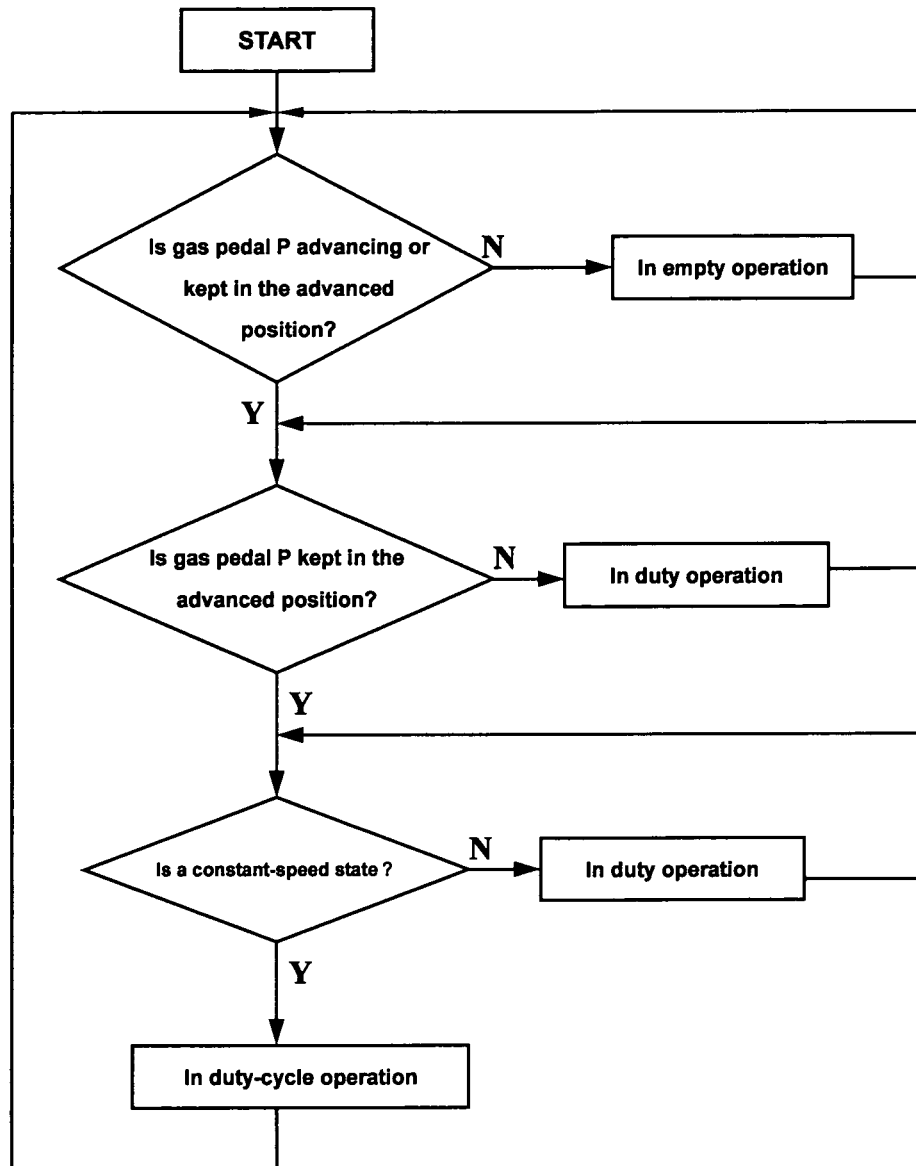
17. The automatic fuel supply adjusting device according to claim 12 or 13, **characterized in that** the preset speed difference value lies in the range between 0 and 50 km/h.

18. The automatic fuel supply adjusting device according to claim 17, **characterized in that** the preset speed difference value lies in the range between 5 and 20 km/h.

19. The automatic fuel supply adjusting device according to claim 12 or 13, **characterized in that** the duty-cycle unit (8) works in the duty operation when the position of the gas pedal (P) reaches 70% of the whole displacement of the gas pedal or exceeds this value.

20. The automatic fuel supply adjusting device according to claim 12 or 13, **characterized in that** the duty-cycle unit (8) is an electromagnetic fuel supply line throttle arranged in the fuel supply line.

21. The automatic fuel supply adjusting device according to claim 12 or 13, **characterized in that** the duty-cycle unit (8) is a control device for controlling the injecting amount of the electrical control injection system.

**Fig.1**

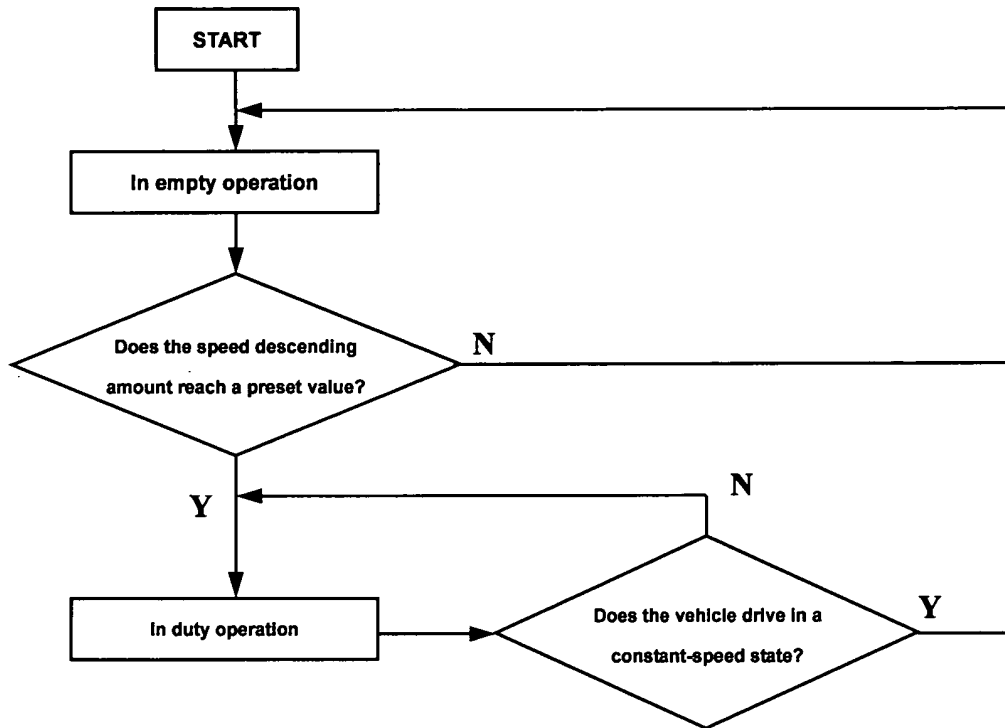


Fig.2

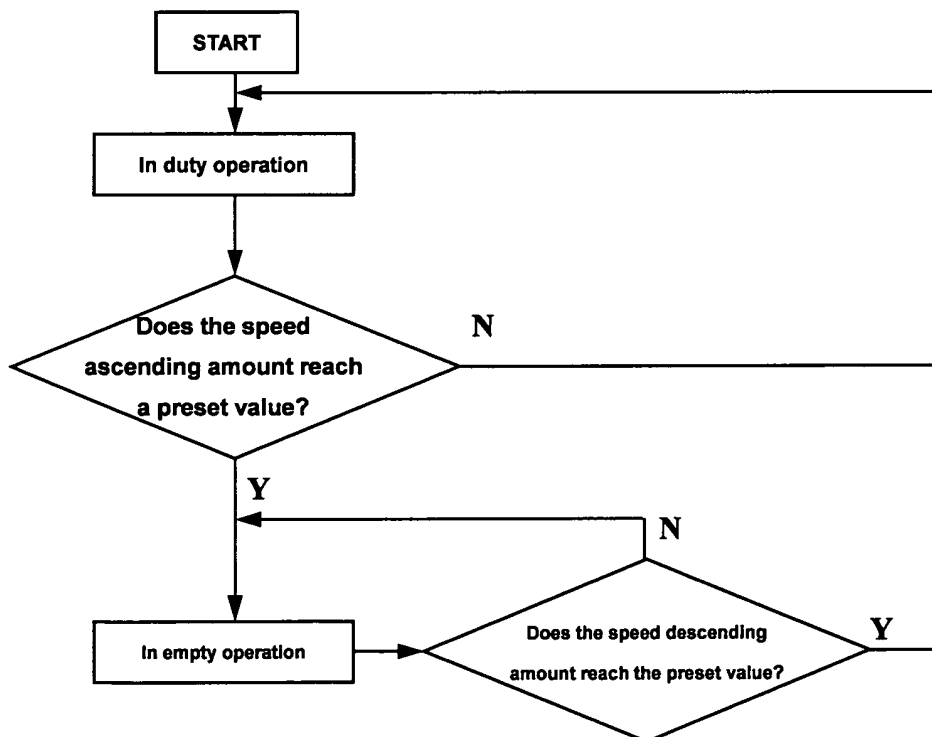
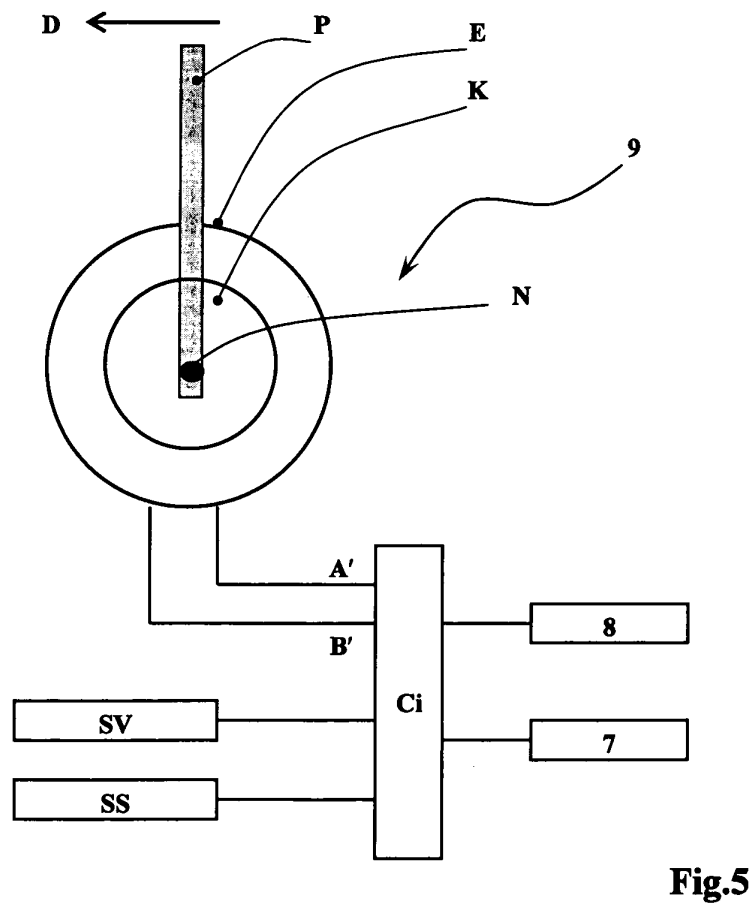
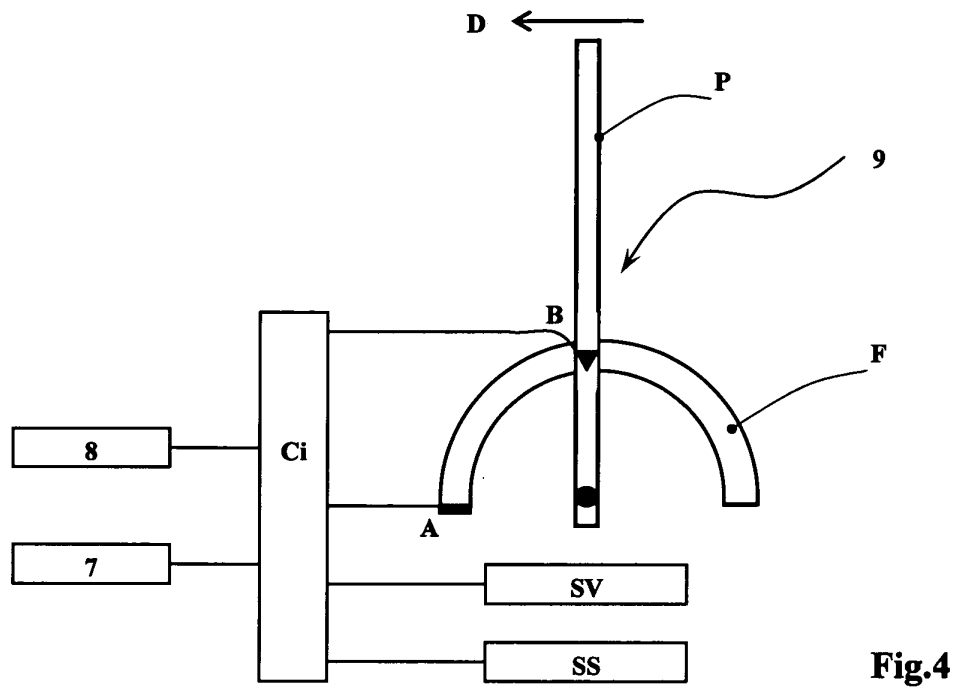


Fig.3



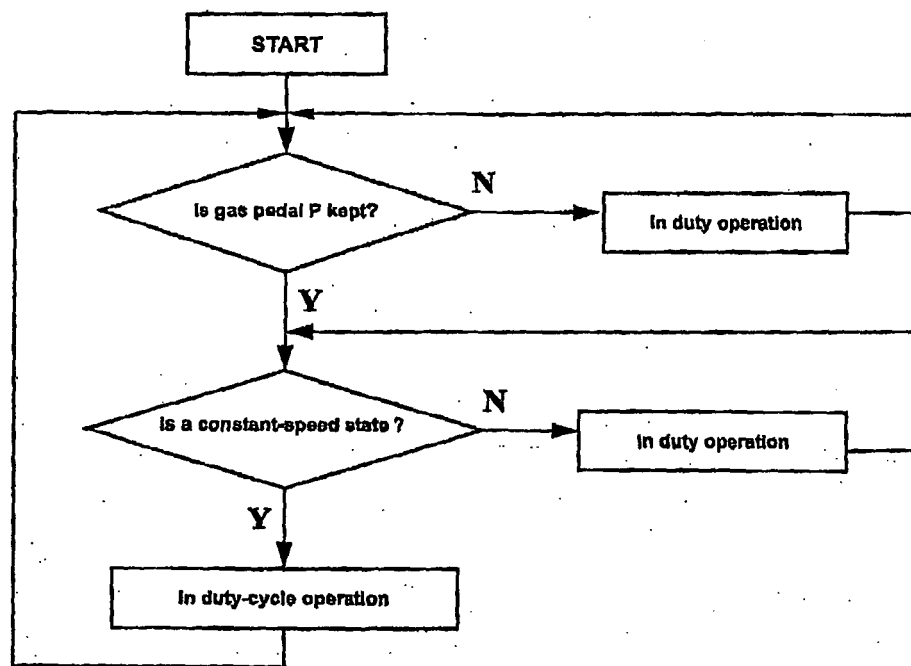


Fig.6

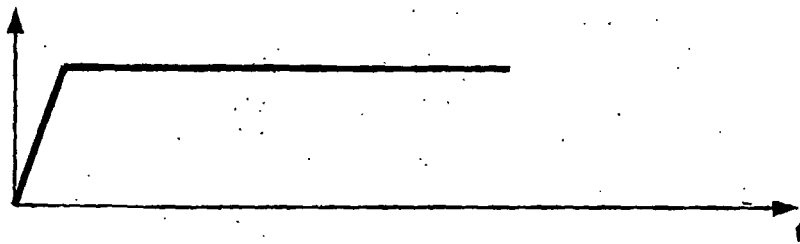


Fig.7a

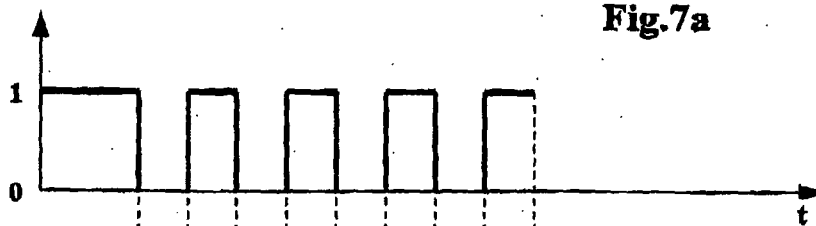


Fig.7b

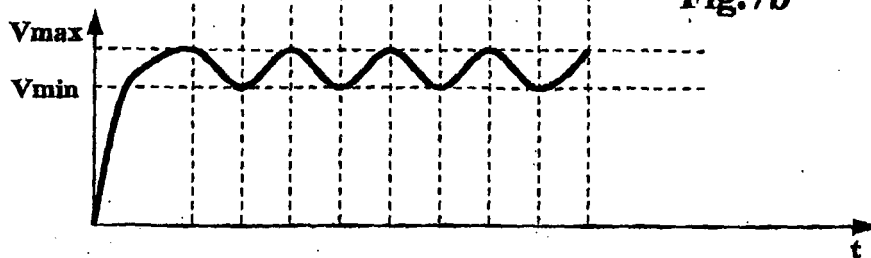


Fig.7c

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2005/002341

A. CLASSIFICATION OF SUBJECT MATTER

F02D 41/00 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC8: F02D,F02M IPC7: B60K IPC3:F02D5/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CHINESE INVENTION CHINESE UTILITY MODEL

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC,WPI,PAJ,CNPAT engine vehicle/car/automobile fuel supply sensor speed accelerator state throttle valve clutch

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP,A,56075929 (DIESEL KIKI CO LTD) 23. Jun. 1981 (23.06.1981) figs.1,3, description	1-21
A	JP,A,6137182 (HONDA MOTOR CO LTD) 17. May. 1994 (17.05.1994) figs1-5, description	1-21
A	JP,A,59101558 (HINO MOTORS LTD) 12. Jun. 1984 (12.06.1984) fig.1,description	1-21
A	JP,A,9317528 (TOYOTA MOTOR CORP) 09. Dec. 1997 (09.12.1997) the whole document	1-21
A	US,A,5685800 (Toukura) 11. Nov. 1997 (11.11.1997) the whole document	1-21

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&”document member of the same patent family

Date of the actual completion of the international search

12. Sep. 2006 (12.09.2006)

Date of mailing of the international search report

26 · OCT 2006 (26 · 10 · 2006)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/CN2005/002341

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP,A,56075929	1981-06-23	None	
JP,A,6137182	1994-05-17	DE,A,4336130	1994-04-28
		US,A,5546306	1996-08-13
JP,A,59101558	1984-06-12	None	
JP,A,9317528	1997-12-09	None	
US,A,5685800	1997-11-11	JP,A,8254139	1996-10-01