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(54) Method and device for simulation of the exhaust gas pressure in the exhaust system especially for diesel engines

(57) The present invention relates to a method and device for simulating the exhaust gas pressure in the exhaust system for internal combustion engines especially diesel engines and shows how to protect the engine from overheating during tuning. Tuning is a series of steps aimed at improving the performance of the particular engine power and rotary moment.

A device for increasing power reads an air flow signal (1) from air flow meter, a boost pressure signal (2), a fuel pressure signal (3), a DPF temperature signal (4), a fuel temperature signal (5), an air temperature signal (6), an additional temperature sensor signal and a signal of open and closed injectors. After processing by the microcontroller M modified signals are issued to the engine controller S.

The device for simulating exhaust gas pressure contains wirelessly connected and working together: a device to increase engine power connected to the engine controller and to the power supply and as an external control panel a touch panel or a mobile device or a PDA or a cell phone or a personal computer.

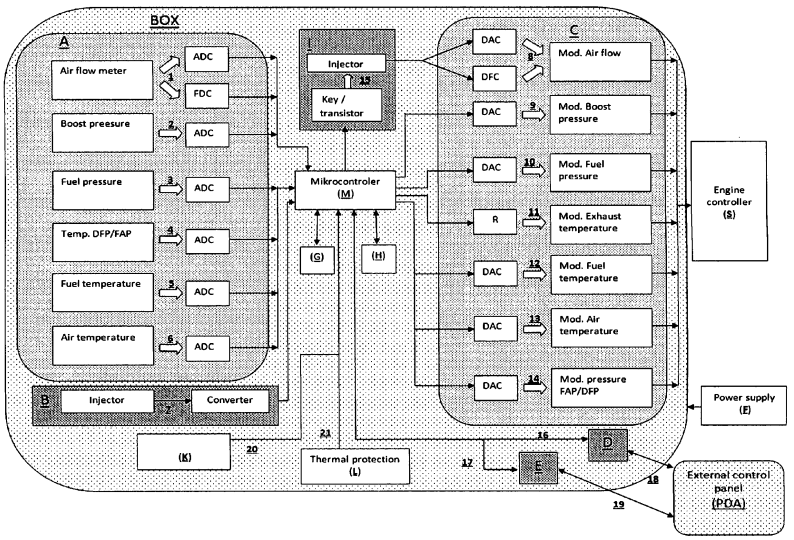

Fig.1

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Description

[0001] The present invention relates to a method and device for simulate the exhaust gas pressure in the exhaust system for internal combustion engines especially diesel engines and shows how to protect the engine from overheating during tuning.

[0002] Tuning is a series of steps aimed at improving the performance of the particular engine power and rotary moment.

[0003] From the Polish patent P-388671 is known an internal combustion engine control system characterized in that it consists of a microprocessor, connected to the counter n mass flow , connected digital analog convener, to the first exhaust temperature sensor, potentiometer, with the passing counter time, whereby to the microprocessor are connected directly counters, analog digital potentiometers, and elapsed time counter.

[0004] From the Polish patent P-382259 external power control module diesel engine, operating in common-rail system is known. This module is a single-channel analog voltage converter, digitally controlled. The module according to the invention consists of a proper external module mounted in the vehicle and a mobile phone operated by a user of the vehicle. External power control module for the engine of the invention, consists of an analog voltage converter, two voltage amplifiers connected in series, with two transmitters digital analog of microcontroller and digital signal input port and output port signals. The module has an internal memory installed, the signal analyzer to monitor the presence of power supply module elements and analog-digital converter. The internal memory is directly connected to the microcontroller module. In addition, the module has installed Bluetooth radio interface, allowing direct wireless connection to your mobile phone and / or personal computer. Mobile phone, is a necessary external equipment module of the invention. Mobile has installed a wireless interface Bluetooth, the phone internal memory, microcontroller, display and keyboard. Microcontroller installed on the module and the microcontroller installed on the mobile phone, with Bluetooth interface, a signal processor module.

[0005] From the Polish patent PL202361 electronic module is known to increase the capacity of engines with electronically controlled fuel injection by controlling the fuel injection control executed by the alternative injection pump . The electronic module according to the invention consists of the analog-digital converters, digital security buffer input, single-chip microcontroller connected to the containing control program and operating system associated directly with embedded memories of different control strategies and model options. The buffer is further coupled with optional synchronization with the controller factory work, which is connected to the microcontroller and the integrated power amplifier. The microcontroller is connected to a digital-analog converters and digital output buffer protection. DACs are connected to the protective buffers, and the safety buffer is combined with integrated power amplifier. The module also has a module installed on the supply voltage, which is connected by the start of the microcontroller module.

[0006] However, the module allows you to control only for engines with fuel injection unit VP44 pump and common-rail.

[0007] The aim of the present invention is to provide a secure hardware tuning which is modifing car engine operating parameters, while monitoring the temperature in several places the vehicle in order to cut off too long ongoing tuning to prevent mechanical damage of vehicle especially the damage of engine.

[0008] Method of simulate the exhaust gas pressure according to the invention characterized in that is measured at the same time intake air mass by the engine with at least one airflow meter and / or sensing the number of revolutions of the engine, and also is measured exhaust gas temperature using flue gas temperature sensor and is checked the injector operation, and thus obtained data are transmitted to the microprocessor of device, and the microprocessor calculates and determines the exhaust temperature correction factor based on the time of working of the injector, while for running injector increases the correction factor of exhaust gas at the time to the maximum set limit, and for not acting injector decreases the correction factor of exhaust gas to the minimum rate limit, and thus achieved increased simulated exhaust gas temperature in relation to actual gas temperature in the exhaust system, then the correction factor of gas pressure is determined on meter of the passing time or signal of distance traveled and exhaust temperature, where for a temperature lower than the threshold is increased exhaust pressure correction factor to a fixed maximum limit, and for temperatures greater than the threshold is reduced exhaust pressure correction factor to a fixed minimum limit, then the microprocessor calculates the pressure and temperature of exhaust gases in the exhaust system, which are send to the engine controller as an modified signals, where the pressure signal corresponds to the actual value of the gas pressure in the system vehicle exhaust.

[0009] Method of protecting the engine from overheating during tuning according to the invention characterized in that, is measured periodically preferably every 1 second, preferably with at least one sensor, is measured an operating temperature and / or the temperature of exhaust gas, and thus obtained signals are transmitted to the central unit, and if the temperature exceeds a threshold temperature, preferably 800 °C for the temperature of the engine and / or preferably 650°C for the temperature of exhaust gas, the CPU temporarily blocks the possibility of hardware tuning of the vehicle until the engine cool below the temperature threshold in to prevent mechanical damage on the car too long and intensive tuning engine operating parameters, the central processing unit carries out a way in the form of a computer program, taking a signal engine coolant temperature preferably 60°C from the engine controller and compares it with the

maximum acceptable temperature, and then if the value exceeds the maximum temperature the microprocessor stops and blocks the action of hardware tuning until the temperature drops below the maximum allowable temperature.

[0010] The central processing unit is: a microprocessor or microcontroller or engine controller or computer.

[0011] Device for simulation exhaust gas pressure according to the invention characterized in that, a device contains wirelessly connected and working together: a device to increase engine power and the external control panel, where the increase engine power device is connected to the engine controller and to the power supply, and as an external control unit is used a : touch panel or the mobile device or PDA or cell phone or a personal computer.

[0012] Communication between device to increase engine power and the external control panel is made by a signal bi-directionally and wirelessly via radio or wi-fi standard(Wireless Fidelity) or IRDA (Infrared Data Association) or Bluetooth.

[0013] Communication between device to increase engine power and the external control panel, is made by a signal bidirectionally and wired with cable or USB connector.

[0014] A device to increase engine power has a structure of connected to the microcontroller blocks : a block for matching the input signals, block of injector, block of modified output signals, block of wireless communication, block of wire communication, block of emulating the injector and also to the microcontroller connected elements: buttons, signaling components - LEDs, thermal protection and block of acceleration and direction of car drive.

[0015] A block for matching the input signals is collecting a signals: an air flow signal from the air mass sensor, a boost pressure signal from the boost pressure sensor or the engine controller, a fuel pressure signal from the fuel pressure sensor, a exhaust gas temperature DPF / FAP signal from the exhaust gas sensor, a fuel temperature signal from the fuel temperature sensor, an air temperature signal from the air temperature sensor, and a with multichannel analog-digital converters and / or frequency measurements signals are converted into digital signals and send to the input of the microcontroller.

[0016] The signals processed and modified by the microcontroller are send to the block of modified output signals, where by multichannel DACs are exposed modified signals: the modified air flow signal, the modified boost pressure signal, a modified fuel pressure signal, modified exhaust temperature signal, modified fuel temperature signal, modified air temperature signal, a modified pressure DPF / FAP signal, which all of them are send to engine controller.

[0017] In the block of injector is taken controlling injector signal and through the converter is send to a microcontroller.

[0018] From the thermal protection which is preferably an external temperature sensor is taken a signal of thermal protection, which is transmitted to the microcontroller.

[0019] External temperature sensor is located on the vehicle's cooling system.

[0020] In the wireless communication block signal from an external control panel is decoded to signal and is send into the microcontroller.

[0021] In the wire communication block signal from an external control panel is decoded to signal and is send to the microcontroller.

[0022] In the injector block the modified signal to the injector from microcontroller is send to the injector.

[0023] The block of acceleration and direction of car drive consists of acceleration sensor and gyroscope sensor permanently attached to the vehicle.

[0024] The device is connected to the main engine controller and allows youser to modify the engine control signals, and thus it is possible to change the performance of the internal combustion engine and power.

[0025] Thermal Protection is an additional temperature sensor mounted in the liquid cooling system engine. The sensor measures the temperature of the coolant and after crossing a temperature of 60°C becomes possible to modify motor control signals. The advantage of this solution is not overloading the motor when it is cold and not allow the engine to overheat and thus the mechanical failure of the engine.

[0026] With the first multi-channel analog-digital converters and frequency measurement, there has been a significant increase in horsepower and rotary moment while maintaining the quality of fuel mixture and exhaust gases.

[0027] Block acceleration and direction through the use of gyro and acceleration sensor to measure acceleration and direction of the vehicle to an automatic adjustment of engine control signals.

[0028] The advantages of the device is an increase engine performance, especially diesel.

[0029] The solution of the invention can be applied to motor sports and everyday use in the car to improve performance.

[0030] An important advantage of the invention is the possibility of convenient wireless control system (BOX) with an external control panel (PDA).

[0031] The invention provides in embodiments in which, Figure 1 shows the circuit diagram and connect it to the main engine controller, Figure 2 shows a general diagram of device, Figure 3 shows diagram of computer program for use in device, Figure 4 shows the interaction of the supervisory program, uses of device box and satellite navigation, Fig.5 shows the overall scheme of connecting the device to the engine driver/controler, Fig.6 shows the diagram of the overall signal flow in device.

[0032] A device contains wirelessly connected and working together: a device to increase engine power **BOX** and the external control panel **PDA**, where the increase engine power device **BOX** is connected to the

engine controller **S** and to the power supply **F**.

[0033] As an external control unit **PDA** is used a : touch panel or the mobile device or PDA or cell phone or a personal computer.

[0034] Communication between device to increase engine power **BOX** and the external control panel **PDA** is made by a signal **18** bi-directionally and wirelessly via radio or wi-fi standard(Wireless Fidelity) or IRDA (Infrared Data Association) or Bluetooth.

[0035] Communication between device to increase engine power **BOX** and the external control panel **PDA,** is made by a signal**19** bidirectionally and wired with cable or USB connector.

[0036] Device to increase engine power **BOX** has a structure of connected to the microcontroller **M** blocks : a block for matching the input signals **A**, block of injector **B,** block of modified output signals **C**, block of wireless communication **D,** block of wire communication **E,** block of emulating the injector and also to the microcontroller **M** connected elements: buttons **G,** signaling components-LEDs **H,** thermal protection **L** and block of acceleration and direction of car drive **K**

[0037] Block for matching the input signals **A** is collecting a signals: an air flow signal **1** from the air mass sensor, a boost pressure signal**2** from the boost pressure sensor or the engine controller **S**, a fuel pressure signal **3** from the fuel pressure sensor, a exhaust gas temperature DPF / FAP signal **4** from the exhaust gas sensor, a fuel temperature signal **5** from the fuel temperature sensor, an air temperature signal **6** from the air temperature sensor, and a with multichannel analog-digital converters and / or frequency measurements signals are converted into digital signals and send to the input of the microcontroller **M.**

[0038] Signals processed and modified by the microcontroller **M** are send to the block of modified output signals **C**,where by multichannel DACs are exposed modified signals: the modified air flow signal Modified boost pressure signal **9**,a modified fuel pressure signal **10**, modified exhaust temperature signal **11,** modified fuel temperature signal **12,** modified air temperature signal **13,** a modified pressure DPF / FAP signal **14,** which all of them are send to engine controller **S.**

[0039] In the block of injector **B** is taken controlling injector signal **7** and through the converter is send to a microcontroller **M.** The injector is opened a signal from the engine controller.

[0040] From the thermal protection **L** which is preferably an external temperature sensor **T** is taken a signal of thermal protection **21**,which is transmitted to the microcontroller **M.**

[0041] External temperature sensor **T** is located on the vehicle's cooling system.

[0042] In the wireless communication block **D** signal **18** from an external control panel **PDA** is decoded to signal **16** and is send into the microcontroller **M.**

[0043] In the wire communication block **E** signal **19** from an external control panel **PDA** is decoded to signal **16** and is send to the microcontroller **M.**

[0044] In the injector block **I** the modified signal to the injector **15** from microcontroller **M** is send to the injector.

[0045] The block of acceleration and direction of car drive **K** consists of acceleration sensor and gyroscope sensor permanently attached to the vehicle.

General operation of the wireless device shown in the following description.

[0046] The device for increasing power **BOX** reads from block for matching the input signals **A** followed signals:

- air flow signal **1** from air flow meter
- boost pressure signal **2**
- fuel pressure signal **3**
- temperature DPF / FAP signal **4** (temperature turbocharger or compressor)
- an additional temperature sensor, indicating whether the engine is warm
- signal of open and close the injectors
- fuel temperature signal **5**
- air temperature signal **6**

[0047] After processing by the microcontroller **M** signals are issued by a block of modified output signals **C** modified signals to the engine controller **S:**

- modified air flow signal **8**
- modify boost pressure signal **9**
- modified fuel pressure signal **10**
- modified exhaust temperature signal **11**
- signal of open and close the injectors
- modified fuel temperature signal **12**
- modified air temperature signal **13**
- exhaust gas pressure signal

[0048] As a result of increased / modified by the microcontroller signals the motor power is increased. Below examples of modifications by the microcontroller **M** input signals in order to issue control signals modified to increase engine power.

Example 1

[0049] We consider only the fuel pressure.

[0050] We measure the fuel pressure signal **3**.It is in the range of 0V to 5V. It is processed by the microcontroller **M** and then passed to the engine controller **S** - modified signal **10.** After crossing the threshold of 2V begin to modify the signal by reducing its value, respectively 0%, 10%, 20% and 30% depending on the selected mode. After crossing the fuel pressure signal 4V stop editing it.

Example 2

[0051] We only consider the airflow.

[0052] We measure the fuel pressure signal **3** and the air flow first It is processed by the microcontroller **M** and then passed to the engine controller **S -** modified signal **10.**Depending on the type of flow meter is an analog signal range from 0V to 5V or Digital to 15 kHz. After crossing the threshold of 100 kg / h of air masses begin to modify the fuel pressure signal by reducing its value, respectively 0%, 10%, 20% and 30% depending on the selected mode. After crossing the air mass 500 kg / h stop modify the pressure signal.

Example3

[0053] We only consider the fuel pressure, boost pressure and air flow.

[0054] We measure the fuel pressure signal **3**,the boost pressure signal **2** and air flow. They are processed by the microcontroller **M** and then passed to the engine controller **S -** modified signals **8, 9** and **10.** Depending on the type of flow meter is an analog signal range from 0V to 5V or Digital to 15 kHz. After crossing the threshold of 100 kg / h air mass signals begin to modify the fuel pressure, boost pressure and the amount of flowed air o reducing their value by 0%, 10%, 20% and 30% depending on the selected mode. After crossing the air mass 500 kg / h stop signals modify all signals to protect against motor overload.

Example 4

[0055] We only consider the fuel pressure and engine coolant temperature.

[0056] We measure the fuel pressure signal **3** and the signal from thermal protection **21.** Fuel pressure signal is in the range of 0V to 5V. It is processed by the microcontroller **M** and then passed to the engine controller **S -** modified signal **10.**After crossing the threshold of 2V begin to modify the signal by reducing its value, respectively 0%, 10%, 20% and 30% depending on the selected mode. Modification occurs only when the coolant temperature is greater than 60°C. After crossing the fuel pressure signal 4V stop editing it.

Example 5

[0057] We only consider the fuel pressure and exhaust gas temperature.

[0058] We measure the fuel pressure signal **3** and the temperature of the exhaust gases **4.**Fuel pressure signal is in the range of 0V to 5V. It is processed by the microcontroller M and then passed to the engine controller **S -** modified signal **10.**After crossing the threshold of 2V begin to modify the signal by reducing its value, respectively 0%, 10%, 20% and 30% depending on the selected mode. Modification occurs only when the temperature of the exhaust gas is less than 750°C. After crossing the fuel pressure signal 4V stop editing it.

Example 6

[0059] We only consider only the work of the injectors.

[0060] We take the signal from the injectors **7** and used to calculate the engine speed. It is processed by the microcontroller **M** and then passed to the injectors - signal **15.**After crossing the threshold of 2000 rev / min beginning to modify the control signals to the injectors by increasing the time of opening, respectively 0%, 10%, 20% and 30% depending on the selected mode. If you exceed 4500 rev / min engine stop modify them.

[0061] If you're working on more modified signals is at least three, it is important to ensuring that the ratio of air to fuel was optimal for the diesel engine (ratio from 12.5: 1 to 14,7:1).

[0062] On the diagram of Fig.3 shows a program installed on device BOX. Figure 4 shows interaction on the supervisory program, program to maintance box, and satellite navigation.

[0063] The programs allow viewing and measurement of modified signals indicate the percentage change in the signal modification and allow you to change modes of operation:

Mode 0 - no modification of
Mode 1-modification values of all signals up to +10%,
Mode 2 - a modification of the values of all signals up to +20%
Mode 3 - modify the values of all signals up to +30%

[0064] The method of protecting the engine from overheating during tuning is that it is preferably measured periodically every 1 second by at least one temperature sensor and the temperature of engine exhaust gas temperature, and so received signals to be transmitted to the central unit **J,** and if the temperature exceeds the temperature threshold of 800 °C for engine temperature and 650°C for the temperature of exhaust gas, the CPU **J** temporarily blocks the possibility of hardware tuning of the vehicle until the engine cool below the temperature threshold to prevent mechanical damage when the car too long and intensive tuning engine parameters.

[0065] The central unit **J** is a microprocessor, microcontroller, engine controller or computer.

[0066] Unit **J** realizes how in the form of a computer program, taking a signal engine coolant temperature preferably 60°C from the engine controller **S** and compares it with the maximum temperature, and then if the value exceeds the maximum permissible temperature of the microprocessor stops and blocks the action of hardware tuning until the temperature drops below the maximum allowable temperature.

[0067] As shown in Fig.5 and Fig.6 pressure and temperature gases in the exhaust system simulates the use of the device **BOX** of the invention. This is done to the

engine with diesel particulate filter removed. Simulation is done solely for the proper operation of the engine driver. The system measures the air mass drawn in by the engine through at least one meter, and measures the temperature of exhaust gases through the flue gas temperature sensor and check the operation of the injector **I.** The resulting data transmitted to the microprocessor **M** of device **BOX,** the microprocessor **M** determines the exhaust gas temperature correction factor based on the time of the injector **I.** For running the injector **I** increases the exhaust gas temperature correction factor Tk-time to the maximum limit set equal to 2, and for not acting injector **I** reduces the exhaust gas temperature correction factor Tk-time to the minimum limit set equal to 1 sets the correction factor gas pressure Pk on the basis of elapsed time counter, or signal the distance traveled and the exhaust gas temperature, and for temperatures lower than the threshold is increased exhaust pressure correction factor to a fixed boundary Pk maximum 1.2 and a temperature greater than the threshold is reduced exhaust pressure correction factor Pk to set a minimum limit of the first thus obtained simulated flue gas temperature increased compared to the actual exhaust gas temperature in the exhaust system. The microprocessor **M** calculates the pressure and temperature exhaust gases in the exhaust system, which gives signals in the form of temperature and pressure signal to the engine controller **S**.

[0068] The temperature is calculated using the formula: Twyj = Twej * Tk

Where: Twej - inlet temperature measured in the exhaust gas temperature sensor

Tk - correction factor

[0069] Tk exhaust gas correction factor is in the range of 1 to 2.

[0070] Pressure is calculated by the formula: Pwyj = P (air mass, temperature) * Pk.

Where: P - the function calculates the pressure in the exhaust system

Pk - correction factor

[0071] Pk gas correction factor is in the range of 1 to 1.2.

[0072] The threshold temperature is 600°C.

The list of symbols:

[0073]

BOX-device for increasing engine power
PDA-external control panel
A-block for matching the input signals
B-block of injector
C-block of modified output signals
D-block of wireless communication
E-block of wire communication
F-power supply
G-buttons
H- signaling elements - LEDs
I- block of injector
K-block of acceleration and direction of car drive
S-engine controller
M-microcontroller
T-external temperature sensor
J- central unit
L- thermal protection
1- air flow signal
2 - boost pressure signal
3- fuel pressure signal
4 - temperature DPF / FAP signal
5 -fuel temperature signal
6- air temperature signal
7 -controlling injector signal
8- modified air flow signal
9 - modify boost pressure signal
10 - modified fuel pressure signal
11 - modified exhaust temperature signal
12 - modified fuel temperature signal
13 - modified air temperature signal
14 - modified pressure DPF / FAP signal
15 - modified signal controlling injector
16 - signal from wireless interface
17 - signal from wire interface
18 -wireless communication signal
19- wire communication signal
20 - acceleration and direction of car drive signal
21 - signal from thermal protection

Claims

1. st Method of simulate the exhaust gas pressure in the exhaust system for internal combustion engines especially diesel engines **characterized in that,** is measured at the same time intake air mass by the engine with at least one airflow meter and / or sensing the number of revolutions of the engine, and also is measured exhaust gas temperature using flue gas temperature sensor and is checked the injector operation **(I),** and thus obtained data are transmitted to the microprocessor **(M)** of device **(BOX),** and the microprocessor **(M)** calculates and determines the exhaust temperature correction factor based on the time of working of the injector **(I),**while for running injector **(I)** increases the correction factor of exhaust gas at the time to the maximum set limit, and for not acting injector **(I)** decreases the correction factor of exhaust gas to the minimum rate limit, and thus achieved increased simulated exhaust gas temperature in relation to actual gas temperature in the exhaust system, then the correction factor of gas pressure is determined on meter of the passing time or signal of distance traveled and exhaust temperature, where for a temperature lower than the threshold is increased exhaust pressure correction factor to a fixed maximum limit, and for temperatures greater than the threshold is reduced exhaust pressure cor-

rection factor to a fixed minimum limit, then the microprocessor **(M)** calculates the pressure and temperature of exhaust gases in the exhaust system, which are send to the engine controller **(S)** as an modified signals, where the pressure signal corresponds to the actual value of the gas pressure in the system vehicle exhaust.

2. nd Method of protecting the engine from overheating during tuning, **characterized in that,** is measured periodically preferably every 1 second, preferably with at least one sensor, is measured an operating temperature and / or the temperature of exhaust gas, and thus obtained signals are transmitted to the central unit **(J),**and if the temperature exceeds a threshold temperature, preferably 800 °C for the temperature of the engine and / or preferably 650°C for the temperature of exhaust gas, the CPU**(J)** temporarily blocks the possibility of hardware tuning of the vehicle until the engine cool below the temperature threshold in to prevent mechanical damage on the car too long and intensive tuning engine operating parameters, the central processing unit **(J)** carries out a way in the form of a computer program, taking a signal engine coolant temperature preferably 60°C from the engine controller **(S)** and compares it with the maximum acceptable temperature, and then if the value exceeds the maximum temperature the microprocessor stops and blocks the action of hardware tuning until the temperature drops below the maximum allowable temperature, wherein the central processing unit **(J)** is: a microprocessor or microcontroller **(M)** or engine controller **(S)** or computer.

3. rd Device for simulation exhaust gas pressure in the exhaust system for internal combustion engines especially diesel engines using microcontroller, counters, A/D converters **characterized in that,** a device contains wirelessly connected and working together: a device to increase engine power **(BOX)** and the external control panel **(PDA),** where the increase engine power device **(BOX)** is connected to the engine controller **(S)** and to the power supply **(F),** and as an external control unit **(PDA)** is used a : touch panel or the mobile device or PDA or cell phone or a personal computer.

4. th The device according to claim. 3, **characterized in that,** communication between device to increase engine power **(BOX)** and the external control panel **(PDA)** is made by a signal **(18)** bidirectionally and wirelessly via radio or wi-fi standard(Wireless Fidelity) or IRDA (Infrared Data Association) or Bluetooth.

5. th The device according to claim. 3, **characterized in that,** communication between device to increase engine power **(BOX)** and the external control panel **(PDA),** is made by a signal**(19)** bidirectionally and wired with cable or USB connector.

6. th The device according to claim. 3, **characterized in that,** a device to increase engine power **(BOX)** has a structure of connected to the microcontroller **(M)** blocks : a block for matching the input signals **(A),** block of injector **(B),** block of modified output signals**(C),** block of wireless communication **(D),** block of wire communication **(E),** block of emulating the injector and also to the microcontroller **(M)** connected elements: buttons**(G),**signaling components - LEDs**(H),**thermal protection **(L)** and block of acceleration and direction of car drive **(K)**

7. th The device according to claim. 6, **characterized in that,** a block for matching the input signals**(A)** is collecting a signals: an air flow signal **(1)** from the air mass sensor, a boost pressure signal**(2)** from the boost pressure sensor or the engine controller (S), a fuel pressure signal **(3)** from the fuel pressure sensor, a exhaust gas temperature DPF / FAP signal **(4)** from the exhaust gas sensor, a fuel temperature signal**(5)** from the fuel temperature sensor, an air temperature signal**(6)** from the air temperature sensor, and a with multichannel analog-digital converters and / or frequency measurements signals are converted into digital signals and send to the input of the microcontroller (M).

8. th The device according to claim. 6, **characterized in that,** the signals processed and modified by the microcontroller **(M)** are send to the block of modified output signals **(C),**where by multichannel DACs are exposed modified signals: the modified air flow signal **(8),** the modified boost pressure signal **(9),**a modified fuel pressure signal **(10),** modified exhaust temperature signal **(11),** modified fuel temperature signal **(12),** modified air temperature signal **(13),** a modified pressure DPF / FAP signal **(14),** which all of them are send to engine controller **(S).**

9. th The device according to claim. 6, **characterized in that,** in the block of injector **(B)** is taken controlling injector signal **(7)** and through the converter is send to a microcontroller **(M).**

10. th The device according to claim. 6, **characterized in that,** from the thermal protection **(L)** which is preferably an external temperature sensor **(T)** is taken a signal of thermal protection (21),which is transmitted to the microcontroller **(M).**

11. th The device according to claim. 10, **characterized in that,** external temperature sensor **(T)** is located on the vehicle's cooling system.

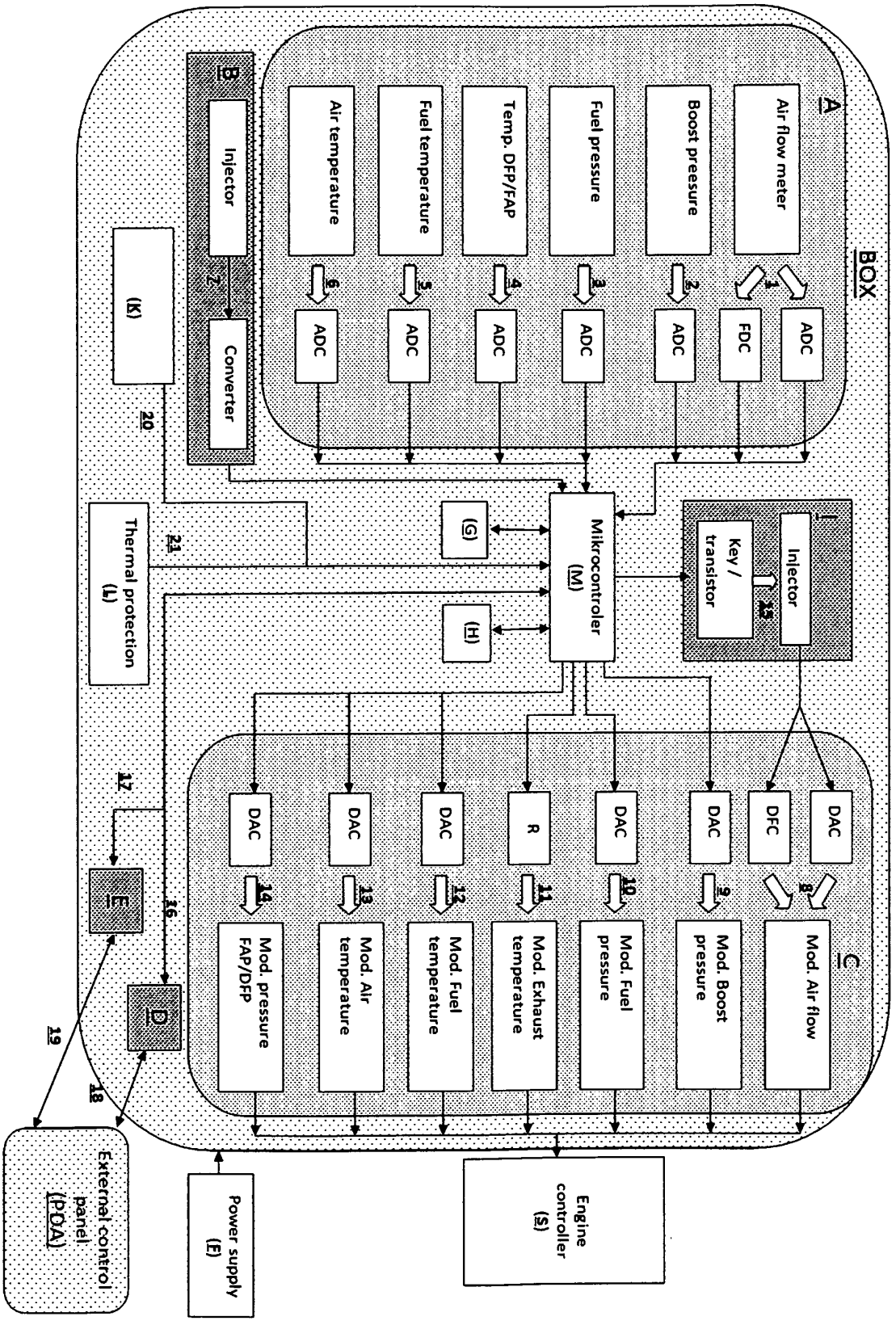
12. th The device according to claim. 6, **characterized**

in that, in the wireless communication block**(D)** signal **(18)** from an external control panel **(PDA)** is decoded to signal **(16)** and is send into the microcontroller**(M).**

13. th The device according to claim. 6, **characterized in that,** in the wire communication block **(E)** signal **(19)** from an external control panel **(PDA)** is decoded to signal **(16)** and is send to the microcontroller **(M).**

14. th The device according to claim. 6, **characterized in that,** in the injector block **(I)** the modified signal to the injector **(15)** from microcontroller **(M)** is send to the injector.

15. th The device according to claim. 6 **characterized in that,** the block of acceleration and direction of car drive **(K)** consists of acceleration sensor and gyroscope sensor permanently attached to the vehicle.


BOX
A
Air flow meter
Boost preesure
Fuel pressure
Temp. DFP/FAP
Fuel temperature
Air temperature
ADC
FDC
ADC
ADC
ADC
ADC
ADC
1
2
3
4
5
6
B
Injector
Converter
12
(K)
20
Mikrocontroler (M)
(G)
(H)
Key / transistor
Injector
15
I
Thermal protection (L)
21
C
DAC
DFC
DAC
DAC
R
DAC
DAC
DAC
8
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11
12
13
14
Mod. Air flow
Mod. Boost pressure
Mod. Fuel pressure
Mod. Exhaust temperature
Mod. Fuel temperature
Mod. Air temperature
Mod. pressure FAP/DFP
17
E
16
D
19
18
External control panel (POA)
Power supply (F)
Engine controller (S)

Fig.1

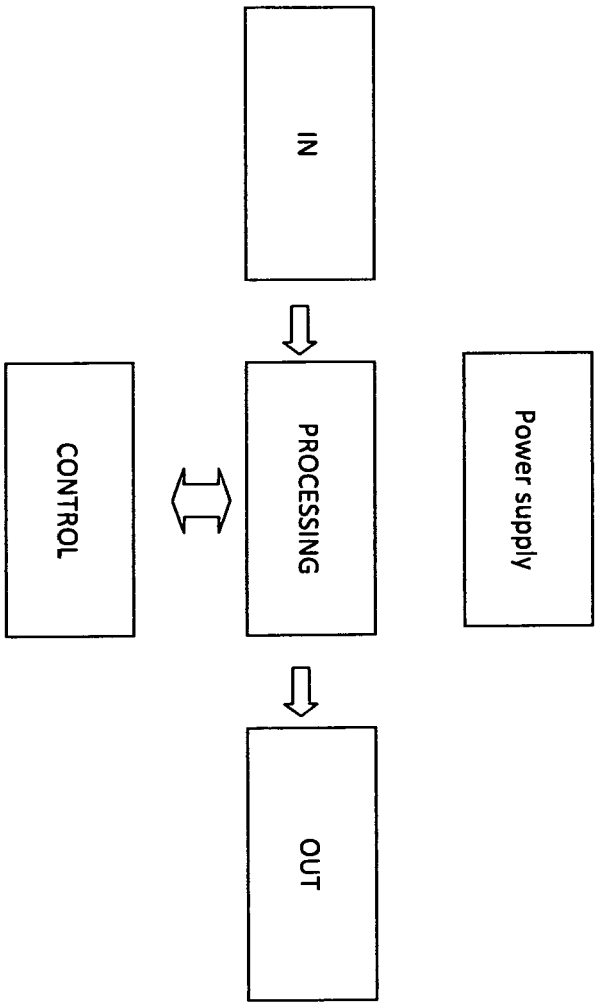

Fig.2

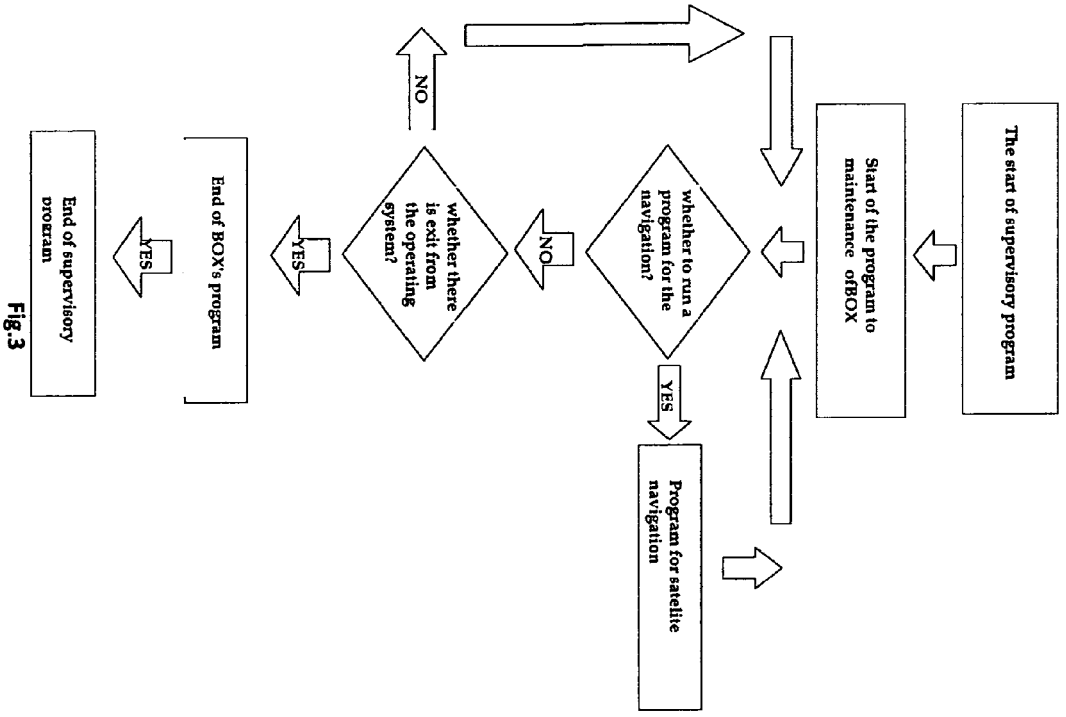
The start of supervisory program
Start of the program to maintenance ofBOX
whether to run a program for the navigation?
YES
Program for satelite navigation
NO
whether there is exit from the operating system?
NO
YES
End of BOX's program
YES
End of supervisory program

Fig.3

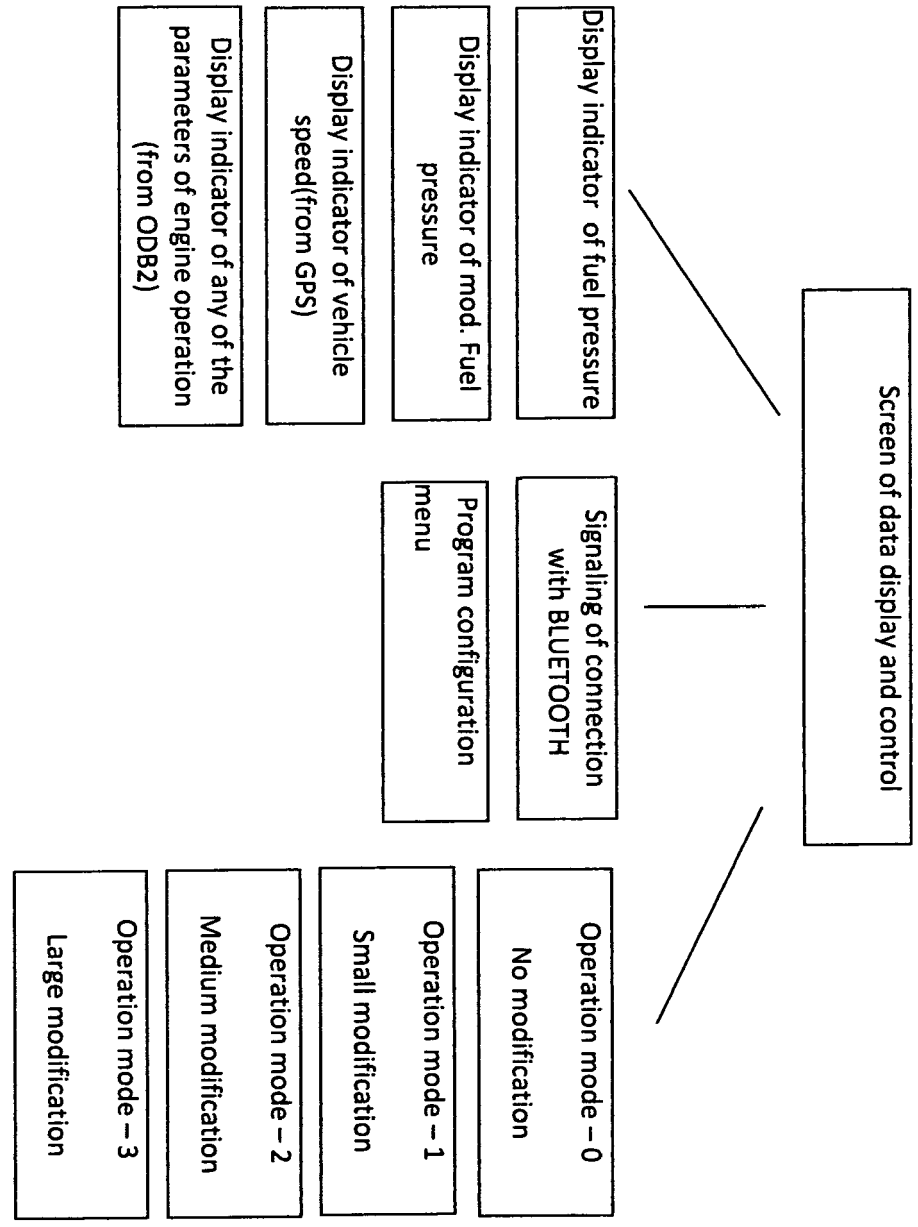
Screen of data display and control
Display indicator of fuel pressure
Display indicator of mod. Fuel pressure
Display indicator of vehicle speed(from GPS)
Display indicator of any of the parameters of engine operation (from ODB2)
Signaling of connection with BLUETOOTH
Program configuration menu
Operation mode – 0
No modification
Operation mode – 1
Small modification
Operation mode – 2
Medium modification
Operation mode – 3
Large modification

Fig.4

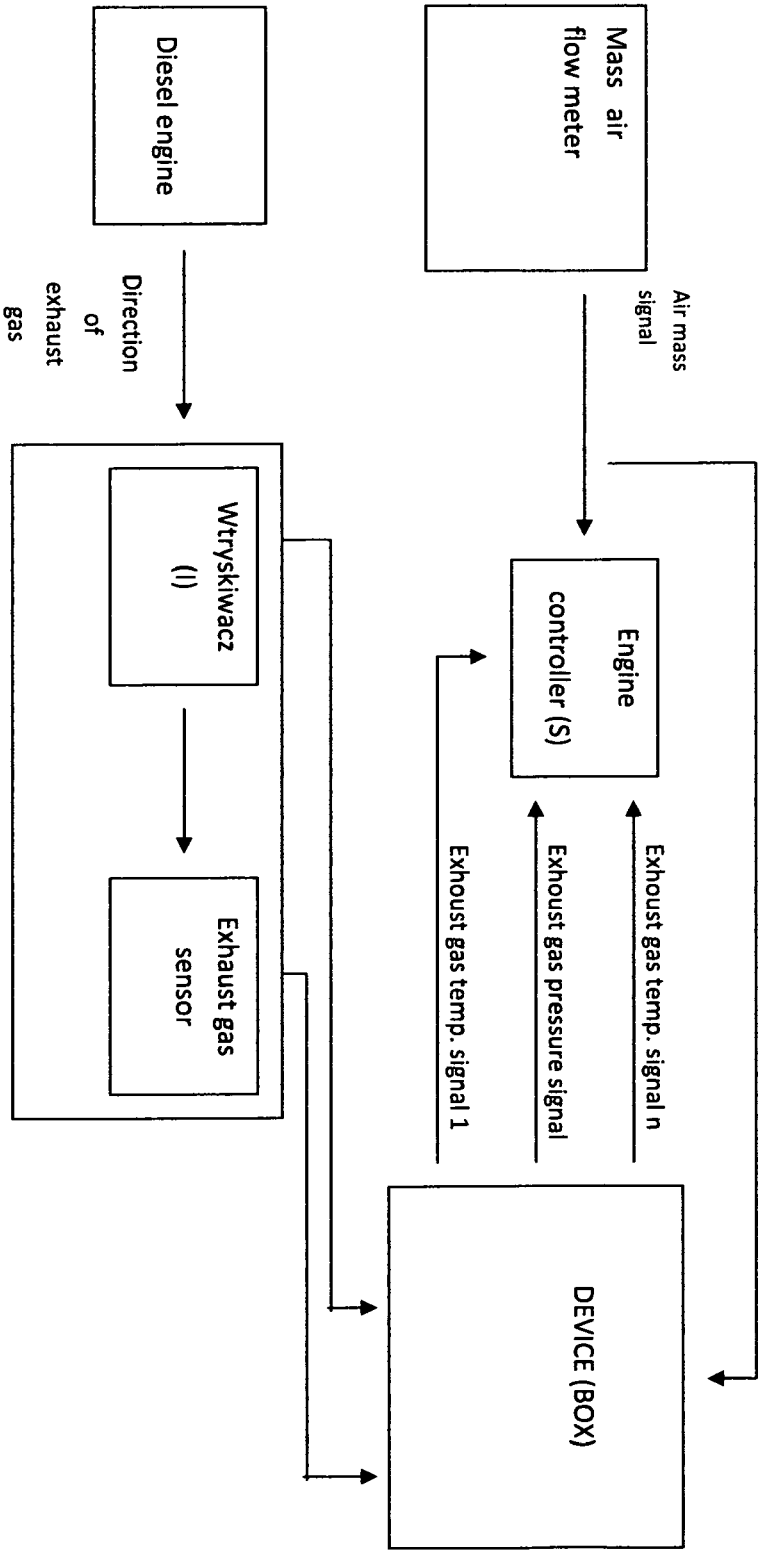
Mass air flow meter
Air mass signal
Diesel engine
Direction of exhaust gas
Wtryskiwacz (I)
Exhaust gas sensor
Engine controller (S)
Exhoust gas temp. signal n
Exhoust gas pressure signal
Exhoust gas temp. signal 1
DEVICE (BOX)

Fig. 5

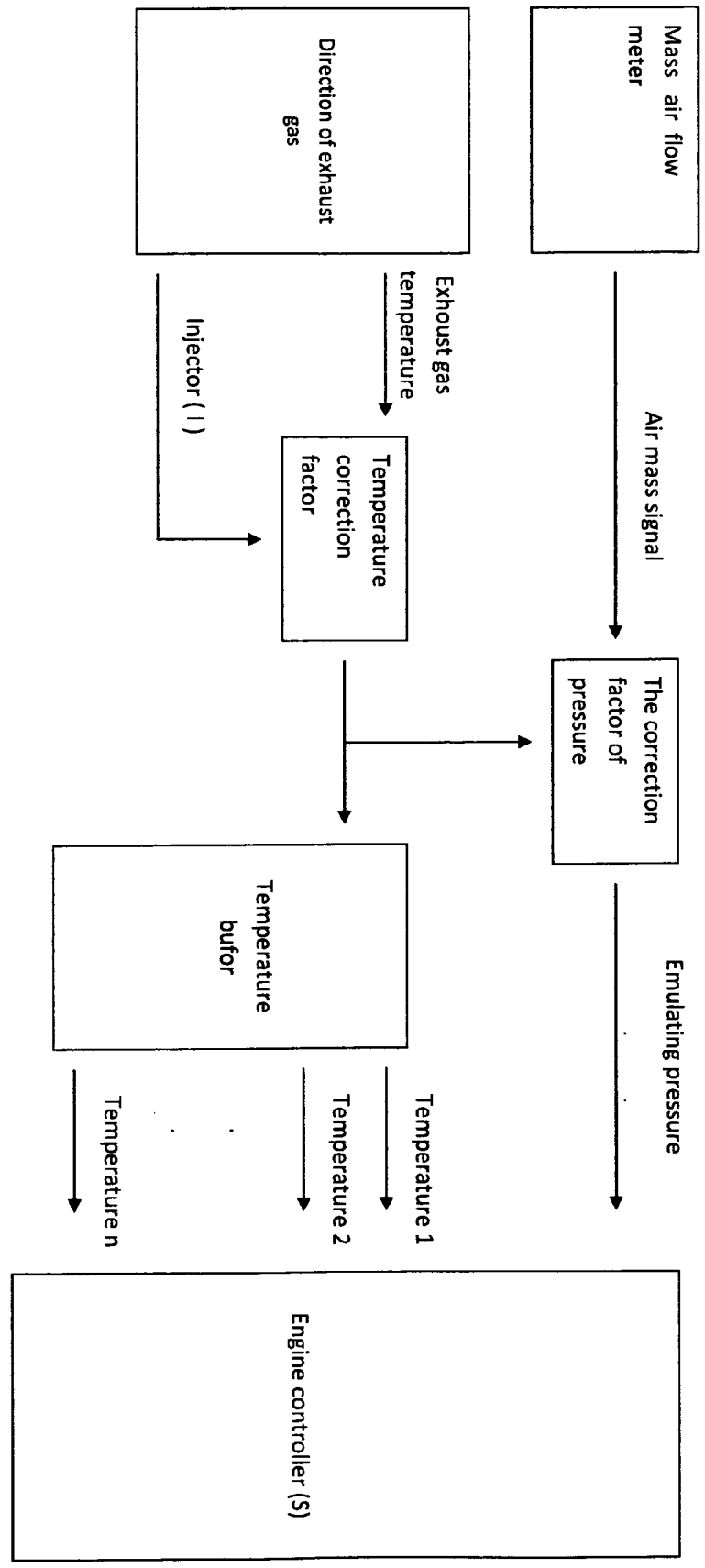
Mass air flow meter
Direction of exhaust gas
Air mass signal
Exhoust gas temperature
Injector (i)
Temperature correction factor
The correction factor of pressure
Temperature bufor
Emulating pressure
Temperature 1
Temperature 2
Temperature n
Engine controller (S)

Fig.6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- PL P388671 **[0003]**
- PL P382259 **[0004]**
- PL 202361 **[0005]**