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(54) DIESEL ENGINE FUEL INJECTION AMOUNT CONTROL DEVICE

VORRICHTUNG ZUR STEUERUNG DER KRAFTSTOFFEINSPRITZUNG IN DIESELMOTOREN

DISPOSITIF DE COMMANDE DE QUANTITE D INJECTION DE CARBURANT D UN MOTEUR DIESEL

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Description

Technical Field

[0001] The present invention relates to a fuel injection amount control apparatus applied to a diesel engine.

Background Art

[0002] In Patent Document 1, there is disclosed a fuel injection amount control apparatus which selects a specific control pattern from a plurality of maximum injection amount control patterns in correspondence to a shift position of a transmission, and controls the maximum injection amount in correspondence to the selected control pattern.

[0003] In Patent Document 2, there is disclosed a fuel injection amount control apparatus provided with first calculating means for calculating an intake amount at a time of a steady operation, and second calculating means for calculating an intake amount at a time of an accelerating operation. The first calculating means calculates the intake amount at a time of the steady operation on the basis of an intake amount detected by an air flow meter or the like. Further, the second calculating means calculates the intake amount at a time of the accelerating operation on the basis of a throttle opening degree and an engine speed. Further, when the operating state of the engine is switched to the accelerating operation from the steady operation, a larger one is selected among the intake amount obtained by the first calculating means and the intake amount obtained by the second calculating means, and the fuel injection amount is determined on the basis of the selected intake amount and the engine speed.

Patent Document 1: Japanese Unexamined Utility Model Publication No. 1-118143
Patent Document 1: Japanese Laid-Open Patent Publication No. 4-365943

[0004] In patent document US2002/0011237 the upper limit fuel injection amount is determined in a a different way for the transient state and non-transient state.

Disclosure of the Invention

[0005] If the fuel injection amount is enlarged, an advantage for a high torque requirement is obtained, but a black smoke tends to be generated. Accordingly, an upper limit value of the fuel injection amount is an important element for avoiding the black smoke generation and considering the high torque requirement.

[0006] The upper limit value of the fuel injection amount is set on the basis of an amount of oxygen drawn into a combustion chamber. The oxygen amount within the combustion chamber is measured, for example, by detecting an intake pressure. However, since a response delay of the intake air is generated at a time of transiting to the accelerating operation from the steady operation (in a transient state), the intake pressure tends to be lower than the steady operation. Further, since an air pressure is lower in a high location than in a flat land, the intake pressure at a time of the steady operation tends to become lower. As mentioned above, since the intake pressure is changed in accordance with the traveling state and the traveling environment of the vehicle, there is a case that the upper limit value of the fuel injection amount is different even in the same engine speed and engine load.

[0007] Further, there is a case that the fuel is injected at different injection timings between the steady operation time and the accelerating operation time. In this case, the upper limit value of the fuel injection amount is different even in the same intake pressure (oxygen amount).

[0008] However, Patent Document 1 does not disclose an idea that the upper limit value of the injection amount is determined so as to be proper to each of the steady operation time, that is, a non-transient state, and the transient state, under the same intake pressure.

[0009] Further, although disclosing the idea that the fuel is injected on the basis of the larger intake amount in the respective intake amounts calculated by a pair of calculating means, under the transient state, Patent Document 2 does not disclose an idea that the upper limit value of the injection amount is determined so as to be proper to each of the non-transient state and the transient state, under the same intake pressure.

[0010] An objective of the present invention is to provide a fuel injection amount control apparatus of a diesel engine which determines an upper limit value of an injection amount so as to be proper to each of a non-transient state and a transient state.

[0011] In order to achieve the object mentioned above, in accordance with a first aspect of the present invention, there is provided a fuel injection amount control apparatus of a diesel engine provided with a fuel injection apparatus, comprising the features of claim 1.

[0012] In accordance with the structure mentioned above, the specifying means specifies the injection amount upper limit value of the fuel by using the first injection amount upper limit value in the case that the operating state of the engine is the transient state, and specifies the injection amount upper limit value of the fuel by using the second injection amount upper limit value information in the case that the operating state of the engine is the non-transient state. The first injection amount upper limit value information corresponds to information of the injection amount upper limit value which is previously determined in correspondence to the oxygen amount relevant value and the transient state, and the injection amount upper limit value corresponds to a limit value of the fuel injection amount complying with the transient state. The second injection amount upper limit value information corresponds to information of the injection amount upper limit value which is previously de-

termined in correspondence to the oxygen amount relevant value and the non-transient state, and the injection amount upper limit value corresponds to a limit value of the fuel injection amount complying with the non-transient state. In this case, it is possible to specify the injection amount upper limit value complying with each of the non-transient state and the transient state, and it is possible to execute the fuel injection in correspondence to each of the injection amount upper limit values.

[0013] In the fuel injection amount control apparatus mentioned above, it is desirable that the fuel injection amount control apparatus be provided with detecting means detecting a value relevant to the amount of the oxygen sucked into the cylinder, that the first injection amount upper limit value information be constituted by a calculating expression of the first injection amount upper limit value having a first correction coefficient of the oxygen amount relevant value, that the second injection amount upper limit value information be constituted by a calculating expression of the second injection amount upper limit value having a second correction coefficient of the oxygen amount relevant value, that the specifying means specify the first correction coefficient of the oxygen amount relevant value in the first injection amount upper limit value information on the basis of the oxygen amount relevant value detected by the detecting means in the case that the operating state of the engine is the transient state, and that the specifying means specify the second correction coefficient of the oxygen amount relevant value in the second injection amount upper limit value information on the basis of the oxygen amount relevant value detected by the detecting means in the case that the operating state of the engine is the non-transient state. In accordance with the structure mentioned above, it is possible to easily determine the injection amount upper limit value complying with each of the non-transient state and the transient state by specifying the first and second correction coefficients of the oxygen amount relevant value.

[0014] In the fuel injection amount control apparatus mentioned above, it is desirable that the detecting means be constituted by intake pressure detecting means detecting the intake pressure. In accordance with the structure mentioned above, it is possible to detect the oxygen amount relevant value at a high precision by the intake pressure detecting means.

[0015] In the fuel injection amount control apparatus mentioned above, it is desirable that a pilot injection be executed prior to a main injection in the diesel engine. Further, in the fuel injection amount control apparatus mentioned above, it is desirable that the control means control the fuel injection amount by changing an injection period of the pilot injection. Further, in the fuel injection amount control apparatus mentioned above, it is desirable that the control means control the fuel injection amount by changing a start timing of the pilot injection. In accordance with these structures, it is possible to intend to improve a specific fuel consumption, and it is possible to reduce a noise generated at a time of combustion.

Brief Description of the Drawings

[0016]

Fig. 1(a) is a schematic view showing an entire structure of a diesel engine and a fuel injection amount control apparatus;

Fig. 1(b) is a map expressing a relationship between an intake pressure and an intake pressure correction coefficient; and

Fig. 2 is a flowchart for explaining a control for specifying the intake pressure correction coefficient.

Best Mode for Carrying Out the Invention

[0017] A description will be given below of an embodiment in which a fuel injection apparatus in accordance with the present invention is applied to a diesel engine for a vehicle with reference to Figs. 1 and 2.

[0018] As shown in Fig. 1(a), a diesel engine 10 is provided with a plurality of cylinders 11, and a cylinder head 12. A plurality of fuel injection nozzles 13 are attached to the cylinder head 12 in correspondence to the respective cylinders 11. Each of the fuel injection nozzles 13 injects a fuel (diesel oil) into each of the cylinders 11. In the present embodiment, the fuel is supplied into each of the cylinders 11 from each of the fuel injection nozzles 13, on the basis of a pilot injection, and a main injection executed after the pilot injection. Specifically, the main injection is started after the piston within the cylinder 11 reaches a compression top dead center, and the pilot injection is started before the piston within the cylinder 11 reaches the compression top dead center.

[0019] An intake manifold 14 is connected to the cylinder head 12. The intake manifold 14 is connected to an intake passage 15, and the intake passage 15 is connected to an air cleaner 17. The intake passage 15 is provided with a throttle valve 18. An opening degree of the throttle valve 18 is adjusted in correspondence to an engine speed and an engine load. A flow rate (an intake amount) of an air introduced to the intake manifold 14 via the air cleaner 17 and the intake passage 15 is adjusted on the basis of a control of the opening degree of the throttle valve 18. Further, a vehicle is provided with an accelerator pedal depression degree detector 19 detecting a pedaling angle (an accelerator pedal depression degree) of an accelerator pedal, and a crank angle detector 20 detecting a rotating angle (a crank angle) of a crank shaft of the engine. Each of the accelerator pedal depression degree detector 19, and the crank angle detector 20 is connected to a control computer C controlling various controls of the vehicle, information relating to the accelerator pedal depression degree is inputted into the control computer C from the accelerator pedal depression degree detector 19, and an information relating to the crank angle is inputted into the computer C from the

crank angle detector 20, respectively. The control computer C calculates an engine speed on the basis of a time change of the crank angle, and calculates an engine load F on the basis of the accelerator pedal depression degree.

[0020] On the diesel engine 10, there is mounted a variable nozzle type turbocharger (hereinafter, refer to as a turbocharger) 16 operated by utilizing exhaust gas discharged from each of the cylinders 11. The intake passage 15 is provided with a compressor portion 161 of the turbocharger 16. In the intake passage 15, the throttle valve 18 is provided between the compressor portion 161 of the turbocharger 16 and the intake manifold 14. The air discharged from the compressor portion 161 passes through the intake passage 15 and the intake manifold 14 and is supplied to each of the cylinders 11.

[0021] In the intake manifold 14, there are arranged an intake air temperature detector 23 detecting a temperature (an intake air temperature) of the air supplied to each of the cylinders 11, and a pressure detector 24 detecting a pressure (an intake pressure) within the intake manifold 14. Each of the intake air temperature detector 23 and the pressure detector 24 is connected to the control computer C. Information of the intake air temperature detected by the intake air temperature detector 23, and information of the intake pressure detected by the pressure detector 24 are inputted into the control computer C.

[0022] On the cylinder head 12, an exhaust manifold 21 is connected to an opposite side to the intake manifold 14. The exhaust manifold 21 is connected to an exhaust passage 22. The exhaust passage 22 is provided with a turbine portion 162 of the turbocharger 16. An exhaust gas generated in each of the cylinders 11 passes through the exhaust manifold 21 and is discharged to the exhaust passage 22.

[0023] The control computer C calculates an injection amount upper limit value Q1 on the basis of a calculation expression [1] of a first injection amount upper limit value shown below, or calculates an injection amount upper limit value Q2 on the basis of a calculation expression [2] of a second injection amount upper limit value.

$$Q1 = H1 \times T \times Qo \quad (1)$$

$$Q2 = H2 \times T \times Qo \quad (2)$$

[0024] In this case, Qo indicates an injection amount upper limit value under a standard atmospheric pressure (= 1 air pressure), H1 and H2 respectively indicate first and second intake pressure correction coefficients, and T indicates an intake air temperature. The first intake pressure correction coefficient H1 corresponds to a first correction coefficient of an oxygen amount relevant value, and the second intake pressure correction coefficient H2 corresponds to a second correction coefficient of the oxygen amount relevant value.

[0025] The control computer C stores a map shown in Fig. 1(b). Curve h1 in Fig. 1(b) expresses a part of a map (hereinafter refer to as a amp M1) of the first intake pressure correction coefficient H1 in the transient state, and curve h2 expresses a part of a map (hereinafter, refer to as a map M2) of the second intake pressure correction coefficient H2 in the non-transient state. Each of curves h1 and h2 is set in correspondence to the intake pressure and the engine speed.

In other words, the map M1 expresses a relationship between the intake pressure and the first intake pressure correction coefficient H1 under the transient state, and is constituted by an assembly of curves set per engine speed. Likewise, the map M2 expresses a relationship between the intake pressure and the second intake pressure correction coefficient H2 under the non-transient state, and is constituted by an assembly of curves set per engine speed. In the present embodiment, the map M1 including curve h1, and the map M2 including the curve h2 correspond to the information of the first and second intake pressure correction coefficients H1 and H2, and are previously determined in correspondence to the intake pressure.

[0026] As shown in Fig. 1(b), the first and second intake pressure correction coefficients H1 and H2 are set in such a manner as to be larger in accordance that the intake pressure becomes higher. This is because the oxygen amount is increased in accordance that the intake pressure becomes higher. Further, the first and second intake pressure correction coefficients H1 and H2 are set such as to be larger in accordance that the engine speed becomes higher.

[0027] Next, a description will be given of a control for specifying the intake pressure correction coefficient by the control computer C with reference to the flowchart in Fig. 2. The control is repeatedly executed by the control computer C in accordance with a predetermined cycle.

[0028] First, the control computer C inputs various detected information such as an engine speed Nx, an accelerator pedal depression degree Kx, an intake pressure Px, an engine load F and the like (step S1). The control computer C determines a target intake pressure Po at a time of a steady operation on the basis of the engine speed Nx and the engine load F (step S2). Further, the control computer C controls a vane opening degree of the turbine portion 162 of the turbocharger 16 in such a manner as to matches a current intake pressure Px with the target intake pressure Po.

[0029] The control computer C compares a current accelerator pedal depression degree Kx with a previously set accelerator pedal depression degree Ko (step S3). In the case that the current accelerator pedal depression degree Kx is equal to or more than the accelerator pedal depression degree Ko (YES in step S3), the control computer C compares a difference |Px - Po| between the detected intake pressure Px and the target intake pres-

sure Po, with a previously set reference value α (step S4).

[0030] In the case that the difference |Px - Po| is equal to or more than the reference value α (YES in step S4), the control computer C determines that the operating state of the engine is the transient state, and specifies the first intake pressure correction coefficient H1 by using the engine speed Nx, the intake pressure Px and the map M1 on the basis of the result of determination (step S5). The control computer C calculates the injection amount upper limit value Q1 by using the specified first intake pressure correction coefficient H1 and the calculation expression [1] (step S6).

[0031] In the case that the current accelerator pedal depression degree Kx does not reach the accelerator pedal depression degree K0 (NO in step S3), or in the case that the difference |Px - Po| does not reach the reference value α (NO in step S4), the control computer C determines that the operating state of the engine is the non-transient state, and specifies the second intake pressure correction coefficient H2 by using the engine speed Nx, the intake pressure Px, and the map M2 on the basis of the result of determination (step S7). The control computer C calculates the injection amount upper limit value Q2 by using the specified second intake pressure correction coefficient H2 and the calculation expression [2] (step S8).

[0032] After the process of step S8, the control computer C specifies a basic fuel injection mode executed at a time of the steady operation on the basis of the engine speed Nx, the accelerator pedal depression degree Kx and the like (step S9). The basic fuel injection mode includes a start timing and an injecting time of the main injection, a start timing and an injecting time of the pilot injection, and a fuel injection amount determined in accordance with the injecting time. In this case, if the fuel injection amount becomes equal to or more than the injection amount upper limit value Q2 at this time, the basic fuel injection mode is changed in such a manner that the value of the fuel injection amount comes to Q2. The fuel injection amount of the basic fuel injection mode specified as mentioned above is set to be equal to or less than the injection amount upper limit value Q2 determined in step S8.

[0033] On the other hand, after the process of step S6, the control computer C specifies the basic fuel injection mode executed at a time of the steady operation on the basis of the engine speed Nx (step S10). Further, the control computer C corrects each of the start timing and the injecting time of the main injection, the start timing and the injecting time of the pilot injection, after specifying the basic fuel injection mode (step S11). The fuel injection amount in the transient state corrected in the manner mentioned above is set to be equal to or less than the injection amount upper limit value Q1 determined in step S6, in accordance with the same operation as that in step S9. In this step S11, there is executed a correction of making the start timing of the pilot injection earlier than that at a time of the steady operation, with respect to the basic fuel injection mode determined by step S10. In accordance with this correction, the injecting time of the pilot injection is extended in comparison with the steady operation time.

[0034] The control computer C executes the pilot injection on the basis of the start timing and the injecting time determined as mentioned above. After the end of the pilot injection, the control computer C executes the main injection amount on the basis of the determined start timing and injecting time. By executing a spark advance control mentioned above, a generation of black smoke can be avoided, and a maximum fuel injection is increased while achieving a high torque requirement. Further, the fuel injection amount is increased by extending the injecting time at a time of the transient operation, in comparison with the conventional method of specifying the maximum fuel injection amount on the basis of the intake pressure regardless of the operating state of the engine, whereby it is possible to improve an acceleration response.

[0035] The accelerator pedal depression degree detector corresponds to engine load detecting means. The crank angle detector 20 constitutes the engine speed detecting means detecting the engine speed, together with the control computer C. The pressure detector 24 corresponds to intake pressure detecting means serving as detecting means. The control computer C constitutes state detecting means detecting whether the operating state of the engine is the transient state or the non-transient state, together with the pressure detector 24 and the engine speed detecting means. Further, the control computer C also corresponds to specifying means specifying an injection amount upper limit value by using the injection amount upper limit value information (the calculation expression [1]) in the case that the operating state of the engine is the transient state, and specifying the injection amount upper limit value by using the second injection amount upper limit value information (the calculation expression [2]) in the case that the operating state of the engine is the non-transient state. Further, the control computer C also corresponds to control means executing the fuel injection in a range equal to or less than the specified first and second injection amount upper limit values.

[0036] In accordance with the present embodiment, the following advantages are obtained.

(1) The control computer C specifies the injection amount upper limit value Q1 by using the calculation expression [1] in the case that the operating state of the engine is the transient state, and specifies the injection amount upper limit value Q2 by using the calculation expression [2] in the case that the operating state of the engine is the non-transient state. The calculation expression [1] corresponds to the information (the first injection amount upper limit value information) of the injection amount upper limit value Q1 previously determined in correspondence

to the oxygen amount relevant value and the transient state, and the injection amount upper limit value Q1 corresponds to the upper limit value of the fuel injection amount complying with the transient state. The calculation expression [2] corresponds to the information (the second injection amount upper limit value information) of the injection amount upper limit value Q2 previously determined in correspondence to the oxygen amount relevant value and the transient state, and the injection amount upper limit value Q2 corresponds to the upper limit value of the fuel injection amount complying with the non-transient state. In this case, it is possible to specify the injection amount upper limit value complying with each of the non-transient state and the transient state, and it is possible to execute the fuel injection in correspondence to each of the injection amount upper limit values. Therefore, it is possible to avoid the generation of the black smoke, and it is possible to achieve an improvement of the torque.

(2) In the case that the operating state of the engine is the transient state, the control computer C specifies the first intake pressure correction coefficient H1 of the calculation expression [1] on the basis of the intake pressure from the pressure detector 24. On the other hand, in the case that the operating state of the engine is the non-transient state, the control computer C specifies the second intake pressure correction coefficient H2 of the calculation expression [2] on the basis of the intake pressure from the pressure detector 24. As mentioned above, it is possible to easily determine the injection amount upper limit value complying with each of the non-transient state and the transient state, by specifying each of the intake pressure correction coefficients H1 and H2.

(3) The pressure detector 24 detects the value (the intake pressure) relevant to the amount of the oxygen sucked into the cylinder 11. It is possible to detect the oxygen amount at a high precision by the pressure detector 24.

(4) In accordance with the present embodiment, the fuel can be supplied into each of the cylinders 11 from each of the fuel injection nozzles 13, on the basis of the pilot injection, and the main injection executed after the pilot injection. In this case, it is possible to slowly burn a small amount of pilot injected fuel together with the fuel injected at an early stage of the main injection in place of immediately burning. Accordingly, since the combustion pressure and the combustion temperature can be restricted low, it is possible to achieve an improvement of a specific fuel consumption, and it is possible to reduce a noise generated at a time of the combustion.

(5) In the case of the transient state, there is executed the correction of making the start timing of the pilot injection earlier than that at a time of the steady operation, by the control computer C. In accordance with the compensation, the injecting time of the pilot injection is extended in comparison with the steady operation time. Therefore, it is possible to achieve the improvement of the specific fuel consumption, and it is possible to reduce the noise generated at a time of the combustion. Further, it is possible to achieve the improvement of the torque.

[0037] In this case, the present embodiment may be modified as follows.

[0038] In the present embodiment, the detecting means may employ an air flow meter detecting a flow rate of the air flowing through the intake path 15.

[0039] In the present embodiment, as the method of supplying the fuel into each of the cylinders 11 from each of the fuel injection nozzles 13, the pilot injection does not need to be used.

[0040] In the present embodiment, the turbocharger 16 does not need to be mounted on the diesel engine 10.

[0041] In the present embodiment, the control computer C may determine the transient state in the case that the current accelerator pedal depression degree Kx is equal to or more than the previously set accelerator pedal depression degree K0, and a change amount per a unit time of the accelerator pedal depression degree Kx is equal to or more than a predetermined value, at a time of determining the operating state of the engine.

[0042] In the present embodiment, the control computer C may calculate the injection amount upper limit value Q1 by setting the first intake pressure correction coefficient H1 of the calculation expression [1] to 1, and calculate the injection amount upper limit value Q2 by setting the second intake pressure correction coefficient H2 of the calculation expression [2] to 1.

Claims

1. A fuel injection amount control apparatus of a diesel engine (10) provided with a fuel injection apparatus, comprising:

   state detecting means (C) detecting whether an operating state of the engine (10) is in a transient state or a non-transient state;
   detecting means (24) detecting an intake pressure (Px) as a value relevant to the amount of the oxygen sucked into the cylinder,
   specifying means (C) storing first injection amount upper limit value information constituted by a calculating expression of the first injection amount upper limit value (Q1) having a first correction coefficient (H1) of the intake pressure (Px) and previously determined in correspond-

ence to the intake pressure (Px) and the transient state, and second injection amount upper limit value information constituted by a calculating expression of the second injection amount upper limit value (Q2) having a second correction coefficient (H2) of the intake pressure and previously determined in correspondence to the intake pressure (Px) and the non-transient state, wherein, in the case that the operating state of the engine (10) is the transient state, said specifying means (C) specifies the first correction coefficient (H1) of the intake pressure (Px) in said first injection amount upper limit value information on the basis of the intake pressure (Px) detected by said detecting means (24), wherein, in the case that the operating state of the engine (10) is the non-transient state, said specifying means (C) specifies the second correction coefficient (H2) of the intake pressure (Px) in said second injection amount upper limit value information on the basis of the intake pressure (Px) detected by said detecting means (24),
wherein the first and second correction coefficients (H1, H2) are specified in a manner to determine the first and second injection amount upper limit values (Q1, Q2) complying with the transient state and the non-transient state in view of different fuel injection modes, and
control means (C) executing a fuel injection at an injection amount equal to or less than the injection amount upper limit value (Q1, Q2) specified by said specifying means (C).

2. The fuel injection amount control apparatus of a diesel engine (10) according to claim 1, wherein said detecting means (24) is constituted by intake pressure detecting means (24) detecting the intake pressure (Px).

3. The fuel injection amount control apparatus of a diesel engine (10) according to any one of claims 1 or 2, wherein a pilot injection is executed prior to a main injection in said diesel engine (10).

4. The fuel injection amount control apparatus of a diesel engine (10) according to claim 3, wherein said control means (C) controls the fuel injection amount by changing an injection period of said pilot injection.

5. The fuel injection amount control apparatus of a diesel engine according to claim 4, wherein said control means (C) controls the fuel injection amount by changing a start timing of said pilot injection.

Patentansprüche

1. Kraftstoffeinspritzmengensteuergerät einer Dieselkraftmaschine (10), die mit einem Kraftstoffeinspritzgerät versehen ist, mit:

einem Zustandserfassungsmittel (C), das erfasst, ob ein Betriebszustand der Kraftmaschine (10) ein transienter Zustand oder ein nicht-transienter Zustand ist;
einem Erfassungsmittel (24), das einen Einlassdruck (Px) als einen Wert erfasst, der für die Menge des in den Zylinder eingesaugten Sauerstoffs relevant ist,
einem Spezifizierungsmittel (C), das eine Erste-Einspritzmenge-Obergrenzwertinformation, die einen Berechnungsausdruck für den Erste-Einspritzmengen-Obergrenzwert (Q1) bildet, der einen ersten Korrekturkoeffizienten (H1) des Einlassdrucks (Px) hat und im Vorfeld in Übereinstimmung mit dem Einlassdruck (Px) und dem transienten Zustand bestimmt wurde, und eine Zweite-Einspritzmenge-Obergrenzwertinformation speichert, die einen Berechnungsausdruck des Zweite-Einspritzmenge-Obergrenzwerts (Q2) bildet, der einen zweiten Korrekturkoeffizienten (H2) des Einlassdrucks hat und im Vorfeld in Übereinstimmung mit dem Einlassdruck (Px) und dem nicht-transienten Zustand bestimmt wurde,
wobei in dem Fall, dass der Betriebszustand der Kraftmaschine (10) der transiente Zustand ist, das Spezifizierungsmittel (C) den ersten Korrekturkoeffizienten (H1) des Einlassdrucks (Px) in der Erste-Einspritzmenge-Obergrenzwertinformation auf der Grundlage des durch das Erfassungsmittel (24) erfassten Einlassdrucks (Px) spezifiziert, wobei in dem Fall, dass der Betriebszustand der Kraftmaschine (10) der nicht-transiente Zustand ist, das Spezifizierungsmittel (C) den zweiten Korrekturkoeffizienten (H2) des Einlassdrucks (Px) in der Zweite-Einspritzmenge-Obergrenzwertinformation auf Grundlage des durch das Erfassungsmittel (24) erfassten Einlassdrucks (Px) spezifiziert,
wobei der erste und der zweite Korrekturkoeffizient (H1, H2) in einer Weise spezifiziert sind, dass der erste und der zweite Einspritzmengen-Obergrenzwert (Q1, Q2) bestimmt werden, die im Hinblick auf verschiedene Kraftstoffeinspritzmodi dem transienten Zustand und dem nicht-transienten Zustand genügen, und
Steuermitteln (C), die eine Einspritzung mit einer Einspritzmenge ausführen, die gleich oder kleiner als der durch das Spezifizierungsmittel (C) spezifizierte Einspritzmengen-Obergrenzwert (Q1, Q2) ist.

2. Kraftstoffeinspritzmengensteuergerät einer Dieselkraftmaschine (10) gemäß Anspruch 1, wobei das Erfassungsmittel (24) durch das den Einlassdruck

(Px) erfassende Einlassdruckerfassungsmittel (24) gebildet ist.

3. Kraftstoffeinspritzmengensteuergerät einer Dieselkraftmaschine (10) gemäß einem der Ansprüche 1 oder 2, wobei eine Voreinspritzung vor einer Haupteinspritzung in der Dieselkraftmaschine (10) ausgeführt wird.

4. Kraftstoffeinspritzmengensteuergerät einer Dieselkraftmaschine (10) gemäß Anspruch 3, wobei das Steuermittel (C) die Kraftstoffeinspritzmenge durch Ändern einer Einspritzdauer der Voreinspritzung steuert.

5. Kraftstoffeinspritzmengensteuergerät einer Dieselkraftmaschine gemäß Anspruch 4, wobei das Steuermittel (C) die Kraftstoffeinspritzmenge durch Ändern einer Startzeitgebung der Voreinspritzung steuert.

Revendications

1. Appareil de commande de quantité d'injection de carburant d'un moteur diesel (10) muni d'un appareil d'injection de carburant, comprenant :

un moyen de détection d'état (C) détectant si un état de fonctionnement du moteur (10) est un état transitoire ou un état non transitoire ;
un moyen de détection (24) détectant une pression d'admission (Px) en tant que valeur relative à la quantité de l'oxygène aspiré dans le cylindre,
un moyen de spécification (C) stockant des informations de première valeur de limite supérieure de quantité d'injection constituées par une expression de calcul de la première valeur de limite supérieure de quantité d'injection (Q1) ayant un premier coefficient de correction (H1) de la pression d'admission (Px) et préalablement déterminées en correspondance avec la pression d'admission (Px) et l'état transitoire, et des informations de deuxième valeur de limite supérieure de quantité d'injection constituées par une expression de calcul de la deuxième valeur de limite supérieure de quantité d'injection (Q2) ayant un deuxième coefficient de correction (H2) de la pression d'admission et préalablement déterminées en correspondance avec la pression d'admission (Px) et l'état non-transitoire,
dans lequel, dans le cas où l'état de fonctionnement du moteur (10) est l'état transitoire, ledit moyen de spécification (C) spécifie le premier coefficient de correction (H1) de la pression d'admission (Px) dans lesdites informations de première valeur de limite supérieure de quantité d'injection sur la base de la pression d'admission (Px) détectée par ledit moyen de détection (24), dans lequel, dans le cas où l'état de fonctionnement du moteur (10) est l'état non-transitoire, ledit moyen de spécification (C) spécifie le deuxième coefficient de correction (H2) de la pression d'admission (Px) dans lesdites informations de deuxième valeur de limite supérieure de quantité d'injection sur la base de la pression d'admission (Px) détectée par ledit moyen de détection (24),
dans lequel les premier et deuxième coefficients de correction (H1, H2) sont spécifiés de manière à déterminer les première et deuxième valeurs de limite supérieure de quantité d'injection (Q1, Q2) conformes à l'état transitoire et l'état non-transitoire en considérant différents modes d'injection de carburant, et
un moyen de commande (C) effectuant une injection de carburant à une quantité d'injection inférieure ou égale à la valeur de limite supérieure de quantité d'injection (Q1, Q2) spécifiée par ledit moyen de spécification (C).

2. Appareil de commande de quantité d'injection de carburant d'un moteur diesel (10) selon la revendication 1, dans lequel ledit moyen de détection (24) est constitué par un moyen de détection de pression d'admission (24) détectant la pression d'admission (Px).

3. Appareil de commande de quantité d'injection de carburant d'un moteur diesel (10) selon l'une quelconque des revendications 1 ou 2, dans lequel une injection pilote est exécutée avant une injection principale dans ledit moteur diesel (10).

4. Appareil de commande de quantité d'injection de carburant d'un moteur diesel (10) selon la revendication 3, dans lequel ledit moyen de commande (C) commande la quantité d'injection de carburant en changeant une période d'injection de ladite injection pilote.

5. Appareil de commande de quantité d'injection de carburant d'un moteur diesel selon la revendication 4, dans lequel ledit moyen de commande (C) commande la quantité d'injection de carburant en changeant un temps de début de ladite injection pilote.

Fig.1 (a)

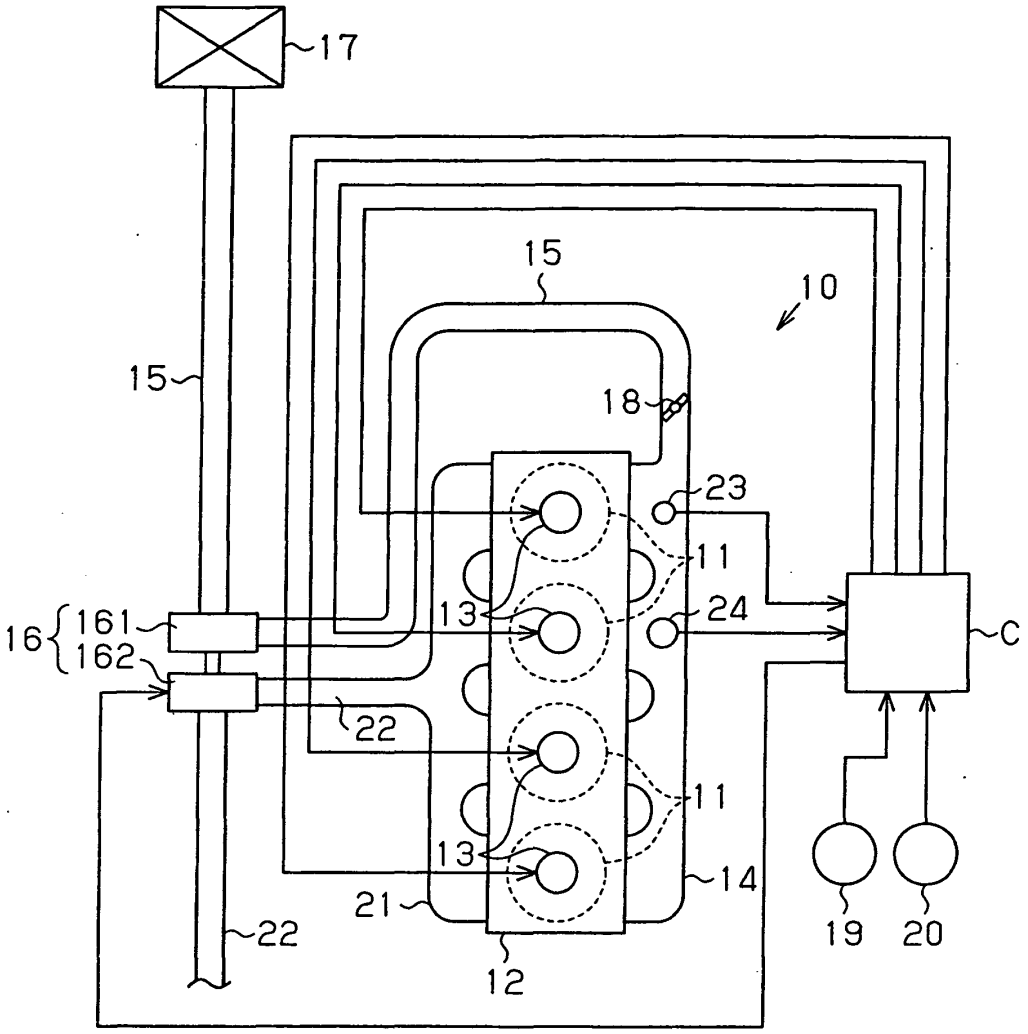

17
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24
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Fig.1 (b)

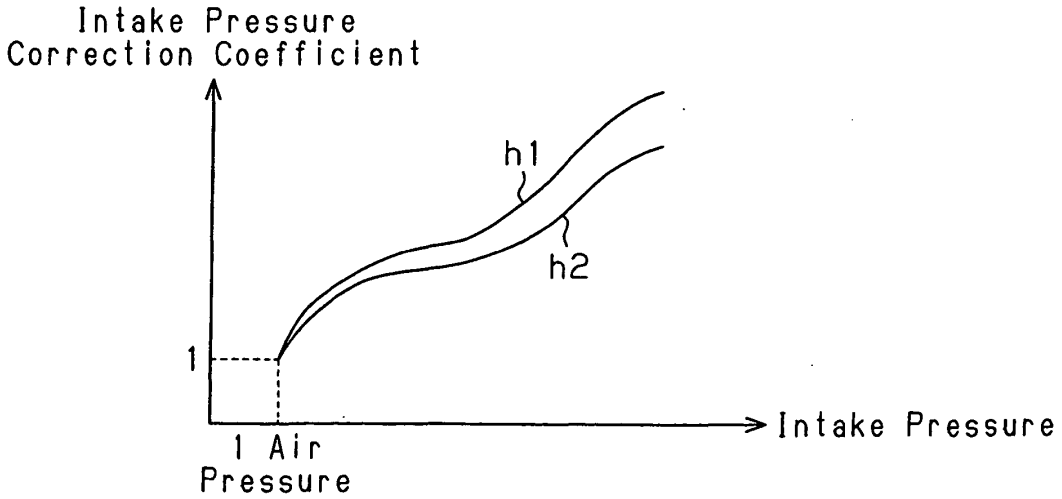
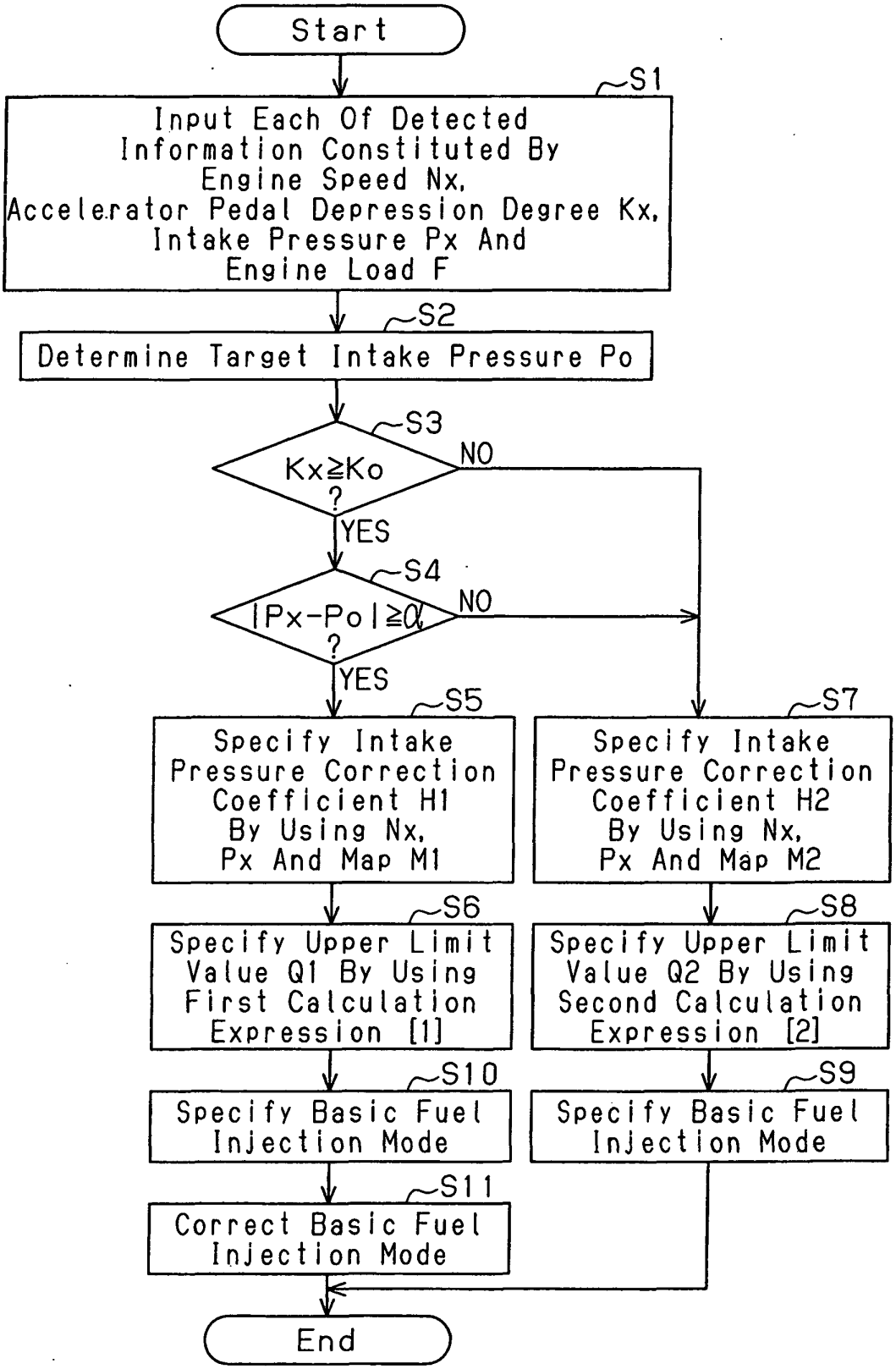

Intake Pressure
Correction Coefficient
h1
h2
1
1 Air
Pressure
Intake Pressure

Fig.2


Start
S1
Input Each Of Detected Information Constituted By Engine Speed Nx, Accelerator Pedal Depression Degree Kx, Intake Pressure Px And Engine Load F
S2
Determine Target Intake Pressure Po
S3
Kx≧Ko ?
NO
YES
S4
|Px-Po|≧α ?
NO
YES
S5
Specify Intake Pressure Correction Coefficient H1 By Using Nx, Px And Map M1
S7
Specify Intake Pressure Correction Coefficient H2 By Using Nx, Px And Map M2
S6
Specify Upper Limit Value Q1 By Using First Calculation Expression [1]
S8
Specify Upper Limit Value Q2 By Using Second Calculation Expression [2]
S10
Specify Basic Fuel Injection Mode
S9
Specify Basic Fuel Injection Mode
S11
Correct Basic Fuel Injection Mode
End

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 1118143 A **[0003]**
- JP 4365943 A **[0003]**
- US 20020011237 A **[0004]**