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(54) **Control unit for controlling bypass in throttle body**

Steuervorrichtung für Drosselklappenbypassleitung

Dispositif de commande du bypass du papillon

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- **PATENT ABSTRACTS OF JAPAN vol. 007, no. 269 (M-259), 30 November 1983 (1983-11-30) & JP 58 148246 A (HITACHI SEISAKUSHO KK), 3 September 1983 (1983-09-03)**
- **PATENT ABSTRACTS OF JAPAN vol. 1997, no. 04, 30 April 1997 (1997-04-30) & JP 08 338269 A (HITACHI LTD;HITACHI AUTOMOT ENG CO LTD), 24 December 1996 (1996-12-24)**

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Description

[0001] The present invention relates to a control unit for controlling a bypass in a throttle body, including: a throttle body having an intake passage communicated to an intake port of an engine; a bypass connected to the intake passage while bypassing a throttle valve for opening/closing the intake passage, the bypass being provided in the throttle body; and a first idle apparatus including a valve body for opening/closing the bypass and a thermosensitive actuating means actuated to move the valve body in the valve closing direction in accordance with the temperature rise of the engine, the first idle apparatus being mounted to the throttle body.

[0002] A control unit according to the preamble of claim 1 is known from GB 1 306 901 A.

[0003] Furthermore, such a control unit for controlling a bypass in a throttle body has been disclosed, for example, in Japanese Utility Model Laid-open No. Sho 59-167940.

[0004] A first idle apparatus provided in the above-described prior art control unit for controlling a bypass in a throttle body is operated to usually keep a valve body at a relatively high opening position and decrease, after start-up of the engine, the amount of intake air to be supplied to the engine via the bypass in accordance with the temperature rise of the engine, that is, in accordance with the progress of the warming operation of the engine, to thereby automatically adjust the first idling speed of the engine; and fully closing, after the warming operation of the engine, the valve body. As a result, the first idle apparatus cannot adjust, after the warming operation, the usual idling speed of the engine.

[0005] As for the above-described first idle apparatus, to adjust the idling speed of the engine, there have been known the following two configurations: (1) to screw, in the throttle body, an idle adjusting thread for adjusting the closed position of a throttle valve, thereby adjusting the amount of intake air passing through the throttle valve; and (2) to provide a second bypass, which is different from the bypass provided in the valve body of the first idle apparatus, in the throttle body and also provide, in the second bypass, an idle adjusting valve for adjusting the amount of intake air flowing in the second bypass.

[0006] The above configuration (1), however, is disadvantageous in that since the intake passage has a diameter larger than that of the bypass, in an extremely low opening degree region of the throttle valve, the amount of intake air is significantly changed even by slightly changing the opening degree of the throttle valve, so that some experience is required to finely adjust the amount of intake air for idling operation. The configuration (2) has a merit of easily performing fine adjustment of the amount of intake air for idling operation because the fine adjustment is performed by the idle adjusting valve provided in the bypass having a diameter smaller than that of the intake passage; however, such a configuration has a disadvantage that since the two bypasses must be provided in the throttle body and further the idle adjusting valve is provided in addition to the first idle apparatus, the structure is complicated and the throttle body is enlarged.

[0007] In view of the foregoing, the present invention has been made, and an object of the present invention is to provide a control unit for controlling a bypass in a throttle body, which is capable of easily performing fine adjustment of the amount of intake air for idling operation by making use of a valve body provided in a first idle apparatus while simplifying the structure and making compact the throttle body.

[0008] To achieve the above object, according to a first feature of the present invention, there is provided a control unit for controlling a bypass in a throttle body, including: a throttle body having an intake passage communicated to an intake port of an engine; a bypass connected to the intake passage while bypassing a throttle valve for opening/closing the intake passage, the bypass being provided in the throttle body; and a first idle apparatus including a valve body for opening/closing the bypass and a thermosensitive actuating means actuated to move the valve body in the valve closing direction in accordance with the temperature rise of the engine, the first idle apparatus being mounted to the throttle body; characterized in that a movable stopping means adapted to be brought into contact with said valve body for adjusting a closed position of the valve body thereby adjusting an amount of intake air for idling of the engine is provided in the throttle body.

[0009] With this first feature, when the engine is heated at a high temperature, the closed position of the valve body of the first idle apparatus is specified by the movable stopping means. Accordingly, the amount of intake air for idling operation of the engine can be adjusted by adjusting the closed position of the valve body by means of operating the movable stopping means, to thereby obtain a desirable idling speed.

[0010] Since the amount of intake air for idling operation of the engine can be adjusted by adjusting the closed position of the valve body of the first idle apparatus as described above, it is possible to eliminate the need of provision of a bypass and an adjusting valve specialized for adjustment of idling operation, and hence to simplify the structure and make compact the throttle body.

[0011] Further, since the amount of intake air is adjusted in the bypass having a diameter smaller than that of the intake passage, it is possible to easily perform the fine adjustment of the amount of intake air.

[0012] According to a second feature of the present invention, in addition to the above first feature, the valve body and the thermosensitive actuating means are connected to each other in such a manner as to be relatively moved within a specific stroke range along the movement direction of the valve body and the thermosensitive actuating means; and a lost motion spring for biasing

the valve body in the valve closing direction is connected to the valve body.

[0013] With this second feature, after the valve body of the first idle apparatus reaches the closed position specified by the movable stopping means, the excess movement of the thermosensitive actuating means of the apparatus is absorbed by deformation of the lost motion spring, so that it is possible to prevent occurrence of excessive stress; and further, the closed position of the valve body can be easily adjusted by the movable stopping means irrespective of the state of the thermosensitive actuating means.

[0014] Hereinafter, one embodiment of the present invention will be described with reference to the accompanying drawings. It is illustrated in:

Fig. 1
A vertical sectional side view of an essential portion of an engine for a motorcycle on which a control unit of the present invention is mounted.

Fig. 2
A sectional view taken on line 2-2 of Fig. 1.

Fig. 3
A sectional view take on line 3-3 of Fig. 2.

Fig. 4
A view illustrating the action of a valve body upon start-up or warming operation of the engine.

Fig. 5
A view illustrating the action of the valve body upon idling operation of the engine.

[0015] Referring first to Fig. 1, a throttle body 3 is mounted, via an intake pipe 2, on one side surface of a cylinder head 1 of an engine E, and an air cleaner 5 is connected to an intake duct 4 connected to the upstream end of the throttle body 3. The upstream side of an intake passage 6 of the throttle body 3 is communicated to the air cleaner 5 via the intake duct 4, and the downstream side of the intake passage 6 is communicated to an intake port 7 of the cylinder head 1 via the intake pipe 2. A butterfly type throttle valve 8 for opening/closing the intake passage 6 is rotatably supported in the throttle body 3. An electromagnetic type fuel injection valve 9 for injecting fuel to the downstream end of the intake port 7 is mounted to the intake pipe 2.

[0016] Upon normal operation of the engine E, at the intake stroke, air filtered by the air cleaner 5 enters in the intake passage 6 through the intake duct 4, being controlled in its flow rate by the throttle valve 8, and is sucked in a combustion chamber 10 of the engine E via the intake port 7. At the same time, fuel in an amount corresponding to the operational state of the engine E is injected to the intake port 7 by the fuel injection valve 9, and is mixed with the above intake air in the combustion chamber 10, to form an air-fuel mixture.

[0017] Referring to Figs. 2 and 3, a bypass 13 which bypasses the throttle valve 8 is provided in the throttle body 3. Both ends of the bypass 13 are connected to the intake passage 6. A fast idle apparatus 15 having a piston type valve body 14 facing to the bypass 13 is mounted to the throttle body 3.

[0018] The throttle body 3 has a valve guide hole 16 in which the valve body 14 is slidably fitted, an inlet chamber 17 opened to an end surface of the valve guide hole 16, and an outlet chamber 18 communicated to one side surface of the valve guide hole 16 via a slit 19 extending in the sliding direction of the valve body 14. The bypass 13 is composed of a bypass upstream portion 13a connected to the upstream side of the intake passage 6, and a bypass downstream portion 13b connected to the downstream side of the intake passage 6. The downstream end of the bypass upstream portion 13a is connected to the inlet chamber 17, and the upstream end of the bypass downstream portion 13b is connected to the outlet chamber 18.

[0019] When the valve body 14 is moved in the valve guide hole 16, the opening degree of the slit 19 is adjusted by the side surface of the valve body 14, and the amount of intake air flowing in the bypass 13 is determined by the opening degree of the slit 19.

[0020] The first idle apparatus 15 is composed of the valve body 14 and a thermosensitive actuating means 20 actuated in accordance with the temperature rise of the engine E. The thermosensitive actuating means 20 includes a housing 22 rigidly fitted in a mounting hole 21 of the throttle body 3; a wax holder 23 formed into a cylindrical shape with its one end closed and fitted in the housing 22; a wax case 25 in which wax 24 is enclosed and which is fitted in the wax holder 23; an output rod 28 slidably fitted in a bearing 26 provided at one end of the wax case 25, which rod has one end opposed to the wax 24 via a seal piston 27 and the other end projecting from the wax case 25; an operating member 29 formed into a cylindrical shape with its one end closed, which member is slidably fitted around the wax case 25 with its inner end surface being in contact with the tip of the output rod 28; a return spring 30 for biasing the operating member 29 on the output rod 28 side; and an electric heater 31 additionally provided on the wax holder 23. The electric heater 31 is electrified after start-up of the engine E for heating the wax 24 in accordance with the temperature rise of the engine E.

[0021] A connecting shaft 34 extending coaxially with the output rod 28 is integrally formed on the outer end surface of the operating member 29. A connecting hole 35 with its one end closed is formed in one end surface, opposite to the inlet chamber 17, of the valve body 14, and the connecting shaft 34 is slidably fitted in the connecting hole 35. An outwardly spread flange 34a is formed at the tip of the connecting shaft 34, and an inwardly spread flange 35a is formed at the opening end of the connecting hole 35. The sliding limit of the connecting shaft 34 and the valve body 14 in the extending direction is specified by the contact of the flanges 34a and 35a with each other. A lost motion spring 36 for biasing the connecting shaft 34 and the valve body 14 in

the extending direction, that is, biasing the valve body 14 in the valve closing direction is contracted between the connecting shaft 34 and the valve body 14.

[0022] When the wax 24 contained in the wax case 25 is contracted in a cold environment, the operating member 29 is retreated by the biasing force of the return spring 30 in such a manner as to push the output rod 28 in the wax case 25. On the other hand, when the wax 24 is heated by the heater 31 and is expanded, the output rod 28 is actuated against the biasing force of the return spring 30 in such a manner as to move the operating member 29 forwardly on the valve body 14 side. Accordingly, the valve body 14 increases the opening degree of the slit 19 when the wax 24 is contracted, and decreases the opening degree of the slit 19 in accordance with the expansion of the wax 24.

[0023] As shown in Fig. 3, a movable stopping means 37 for adjusting the closed position of the valve body 14 is provided to the throttle body 3. The movable stopping means 37 is composed of a stopper bolt 38 and a coil spring 39. The stopper bolt 38 is screwed in the throttle body 3 in such a manner that the tip thereof passes through the inlet chamber 17 and faces to the end surface of the valve body 14. The coil spring 39 is held between the head of the stopper bolt 38 and the throttle body 3 for preventing irregular movement of the stopper bolt 38.

[0024] Next, the function of this embodiment will be described.

[0025] Since the wax 24 is contracted in a cold environment, the operating member 29 is retreated by the biasing force of the return spring 30. In such a state, since the connecting shaft 34 of the operating member 29 and the valve body 14 are connected to each other in a state in which the outwardly spread flange 34a and the inwardly spread flange 35a are in contact with each other by the biasing force of the lost motion spring 36. As a result, the valve body 14 is kept, by the operating member 29, at a high opening position at which the slit 19 is largely opened as shown in Fig. 4.

[0026] When the engine E is started in a state in which the throttle valve 8 is full-closed, air is sucked in the engine E via the bypass 13. At this time, since the slit 19 is largely opened, a relatively large amount of air is sucked through the slit 19, with a result that the large amount of air is mixed with fuel injected from the fuel injection valve 9, to form a relatively large amount of a rich mixture suitable for start-up of the engine, thereby certainly starting the engine E. Even in the warming operation state of the engine E, since a relatively large amount of a rich mixture is supplied to the engine E like the start-up state of the engine E, it is possible to ensure a first idling speed of the engine E, and hence to promote the warming of the engine E.

[0027] As the temperature of the engine E is raised along with the progress of the warming operation, the wax 24 is heated by the heater 31 and is expanded, to move the operating member 29 forwardly against the biasing force of the return spring 30. The valve body 14 is thus pushed in the valve closing direction, to decrease the opening degree of the slit 19. As a result, the amount of intake air passing through the bypass 13 is decreased, and the amount of fuel injected from the fuel injection valve 9 is correspondingly decreased, so that the first idling speed is reduced.

[0028] When the valve body 14 reaches the position being in contact with the stopper bolt 38, that is, the closed position, the opening degree of the slit 19 is minimized and thereby the amount of intake air passing through the slit 19 is minimized. The normal idling speed of the engine E can be ensured by the minimum amount of intake air. Accordingly, the closed position of the valve body 14 can be changed by adjusting the shift of the stopper bolt 30 to or from the valve body 14, to adjust the minimum amount of intake air, thereby adjusting the idling speed at a desired value. Also, since the adjustment of the minimum intake air is performed by adjusting the opening degree of the slit 19 provided in the bypass 14 having a diameter very smaller than that of the intake passage 6, it is possible to easily perform fine adjustment of the minimum amount of intake air without the need of special experiences. Further, since the valve body 14 of the first idle apparatus 15 serves as an idle adjusting valve for adjusting the amount of intake air for idling operation of the engine E, it is possible to eliminate the need of provision of a bypass and an adjusting valve specialized for adjustment of idling, and hence to simplify the structure and make compact the throttle body 3.

[0029] As the wax 24 is further expanded to further move the operating member 29 forwardly, the connecting shaft 34 moved forwardly in the connecting hole 35 of the valve body 14 while compressing the lost motion spring 36, so that it is possible to avoid occurrence of excess stress by absorbing excess expansion of the wax 24 by the lost motion spring 36 while keeping the valve body 14 at a specific closed position. This means that even when the stopper bolt 38 is moved to or from the valve body 14 for adjusting the idling speed, the closed position of the valve body 14 can be easily, certainly adjusted irrespective of the expansion state of the wax 24.

[0030] In this embodiment, the present invention is applied to the throttle body 3 of the fuel injection type engine E, and accordingly, the valve body 14 of the bypass 13 is configured to adjust the flow rate of only air. As a result, upon idling operation of the engine E, the air-fuel ratio can be freely adjusted by increasing/decreasing the flow rate of air flowing through the bypass 13 by the valve body 14 while keeping the amount of fuel injected from the fuel injection valve 9 at a specific value, and even when the injected amount of fuel is charged upon idling operation, the amont of air flowing through the bypass 13 can be adjusted by the valve body 14 in such a manner as to keep the air-fuel ratio at a specific value.

[0031] The present invention according to the inde-

pendent claim 1 is not limited to the above embodiment, and it is to be understood that changes in design may be made without departing from the scope of the present invention. For example, the slit 19 may be replaced with a number of through-holes arranged in line or in a zigzag pattern.

[0032] As described above, according to the first feature of the present invention, there is provided a control unit for controlling a bypass in a throttle body, including: a throttle body having an intake passage communicated to an intake port of an engine; a bypass connected to the intake passage while bypassing a throttle valve for opening/closing the intake passage, the bypass being provided in the throttle body; and a first idle apparatus including a valve body for opening/closing the bypass and a thermosensitive actuating means actuated to move the valve body in the valve closing direction in accordance with the temperature rise of the engine, the first idle apparatus being mounted to the throttle body; wherein a movable stopping means for adjusting a closed position of the valve body thereby adjusting an amount of intake air for idling of the engine is provided in the throttle body. As a result, the amount of intake air for idling operation of the engine can be adjusted by adjusting the closed position of the valve body of the first idle apparatus, so that it is possible to eliminate the need of provision of a bypass and an adjusting valve specialized for adjustment of idling operation, and hence to simplify the structure and make compact the throttle body. Further, since the amount of intake air is adjusted in the bypass having a diameter smaller than that of the intake passage, it is possible to easily perform the fine adjustment of the amount of intake air.

[0033] According to the second feature of the present invention, the valve body and the thermosensitive actuating means are connected to each other in such a manner as to be relatively moved within a specific stroke range along the movement direction of the valve body and the thermosensitive actuating means; and a lost motion spring for biasing the valve body in the valve closing direction is connected to the valve body. With this second feature, after the valve body of the first idle apparatus reaches the closed position specified by the movable stopping means, the excess movement of the thermosensitive actuating means of the apparatus is absorbed by deformation of the lost motion spring, so that it is possible to prevent occurrence of excessive stress; and further, the closed position of the valve body can be easily adjusted by the movable stopping means irrespective of the state of the thermosensitive actuating means.

[0034] In summary it is an object to adjust the amount of intake air for idling operation by making use of a valve body provided in a first idle apparatus.

To achieve this, a bypass 13 connected to an intake passage 6 while bypassing a throttle valve 8 for opening/closing the intake passage 6 is provided in a throttle body 3. A first idle apparatus 15 including a valve body 14 for opening/closing the bypass 13 and a thermosensitive actuating means 20 actuated to move the valve body 14 in the valve closing direction in accordance with the temperature rise of an engine E is mounted to the throttle body 3. A movable stopping means 37 for adjusting a closed position of the valve body 14 thereby adjusting an amount of intake air for idling of the engine E is provided in the throttle body 3.

Claims

1. A control unit for controlling a bypass in a throttle body, comprising:

a throttle body (3) having an intake passage (6) communicated to an intake port (7) of an engine (E);
a bypass (13) connected to said intake passage (6) while bypassing a throttle valve (8) for opening/closing said intake passage (6), said bypass (13) being provided in said throttle body (3); and
a first idle apparatus (15) including a valve body (14) for opening/closing said bypass (13) and a thermosensitive actuating means (20) actuated to move said valve body (14) in the valve closing direction in accordance with the temperature rise of said engine (E), said first idle apparatus (15) being mounted to said throttle body (3);

characterized in that
a movable stopping means (37) adapted to be brought into contact with said valve body (14) for adjusting a closed position of said valve body (14) thereby adjusting an amount of intake air for idling of said engine (E) is provided in said throttle body (3).

2. A control unit for controlling a bypass in a throttle body according to claim 1, wherein said valve body (14) and said thermosensitive actuating means (20) are connected to each other in such a manner as to be relatively moved within a specific stroke range along the movement direction of said valve body (14) and said thermosensitive actuating means (20); and

a lost motion spring (36) for biasing said valve body (14) in the valve closing direction is connected to said valve body (14).

Patentansprüche

1. Steuer/Regeleinheit zum Steuern/Regeln eines Bypasses in einem Drosselkörper, umfassend:

einen Drosselkörper (3) mit einem Einlassdurchgang (6), welcher mit einem Einlasskanal (7) eines Motors (E) verbunden ist;
einen Bypass (13), welcher mit dem Einlassdurchgang (6) verbunden ist, während er ein Drosselventil (8) zum Öffnen/Schließen des Einlassdurchgangs (6) umgeht, wobei der Bypass (13) in dem Drosselkörper (3) vorgesehen ist; und
eine erste Leerlaufvorrichtung (15), welche einen Ventilkörper (14) zum Öffnen/Schließen des Bypasses (13) und ein thermosensitives Betätigungsmittel (20) umfasst, welches derart betätigt wird, dass der Ventilkörper (14) in die Ventilschließrichtung gemäß dem Temperaturanstieg des Motors (E) bewegt wird, wobei die erste Leerlaufvorrichtung (15) an dem Drosselkörper (3) angebracht ist;

dadurch gekennzeichnet,
dass ein bewegliches Anschlagmittel (37) in dem Drosselkörper (3) vorgesehen ist, welches dazu ausgebildet ist, in Kontakt mit dem Ventilkörper (14) zur Einstellung einer Schließposition des Ventilkörpers (14) gebracht zu werden, um auf diese Weise eine Ansaugluftmenge für den Leerlauf des Motors (E) einzustellen.

2. Steuer/Regeleinheit zum Steuern/Regeln eines Bypasses in einem Drosselkörper gemäß Anspruch 1, wobei der Ventilkörper (14) und das thermosensitive Betätigungsmittel (20) miteinander derart verbunden sind, dass sie innerhalb eines bestimmten Hubbereichs längs der Bewegungsrichtung des Ventilkörpers (14) und des thermosensitiven Betätigungselements (20) relativ zueinander bewegt werden; und wobei eine Totgangfeder (36) zum Vorspannen des Ventilkörpers (14) in die Ventilschließrichtung mit dem Ventilkörper (14) verbunden ist.

Revendications

1. Dispositif de commande pour commander le bypass d'un papillon, comprenant :

un papillon (3) ayant un passage d'admission (6) en communication avec un orifice d'admission d'un moteur (E);
un bypass (13) relié audit passage d'admission (6) tout en contournant une soupape d'étranglement (8) pour ouvrir/fermer ledit passage d'admission (6), ledit bypass (13) étant placé dans ledit papillon (3) ; et
un premier dispositif de marche à vide (15) comprenant un obturateur de soupape (14) pour ouvrir/fermer ledit bypass (13) et un moyen d'actionnement thermosensible (20) actionné pour déplacer ledit obturateur de soupape (14) dans la direction de fermeture de soupape en fonction de l'augmentation de température dudit moteur (E), ledit premier dispositif de marche à vide (15) étant monté sur ledit papillon (3) ;

caractérisé en ce que
un moyen de butée mobile (37) adapté pour être mis en contact avec ledit obturateur de soupape (14) pour ajuster une position fermée dudit obturateur de soupape (14) en réglant ainsi une quantité d'air d'admission pour la marche à vide dudit moteur (E) est placé dans ledit papillon (3).

2. Dispositif de commande pour commander le bypass d'un papillon selon la revendication 1, dans lequel ledit obturateur de soupape (14) et ledit moyen d'actionnement thermosensible (20) sont reliés l'un à l'autre de manière à être déplacés l'un par rapport à l'autre dans une étendue de course spécifique le long de la direction de mouvement dudit obturateur de soupape (14) et dudit moyen d'actionnement thermosensible (20) ; et
un ressort à course morte (56) destiné à solliciter ledit obturateur de soupape (14) dans la direction de fermeture de soupape est relié audit obturateur de soupape (14).

Fig.1

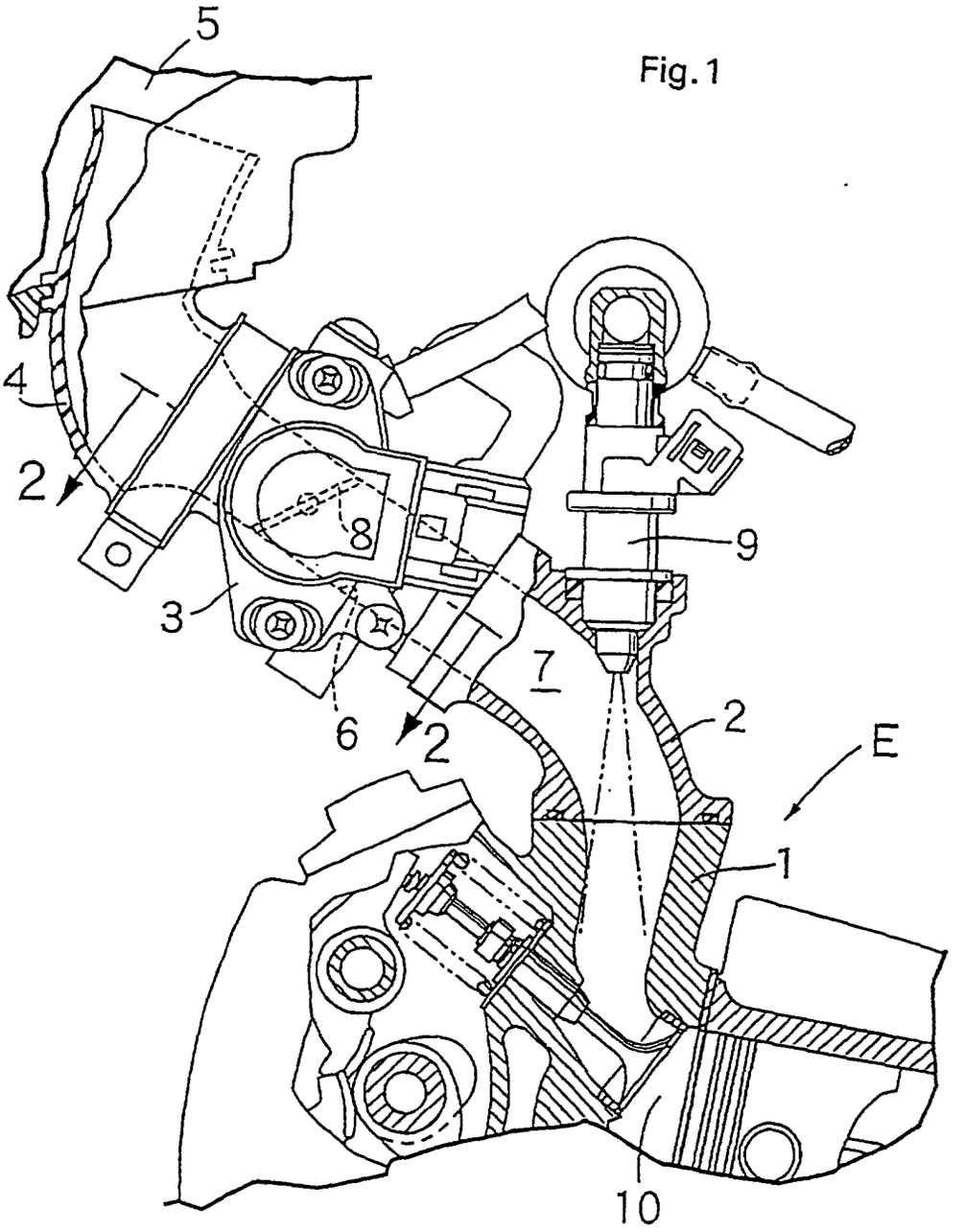


Fig.2

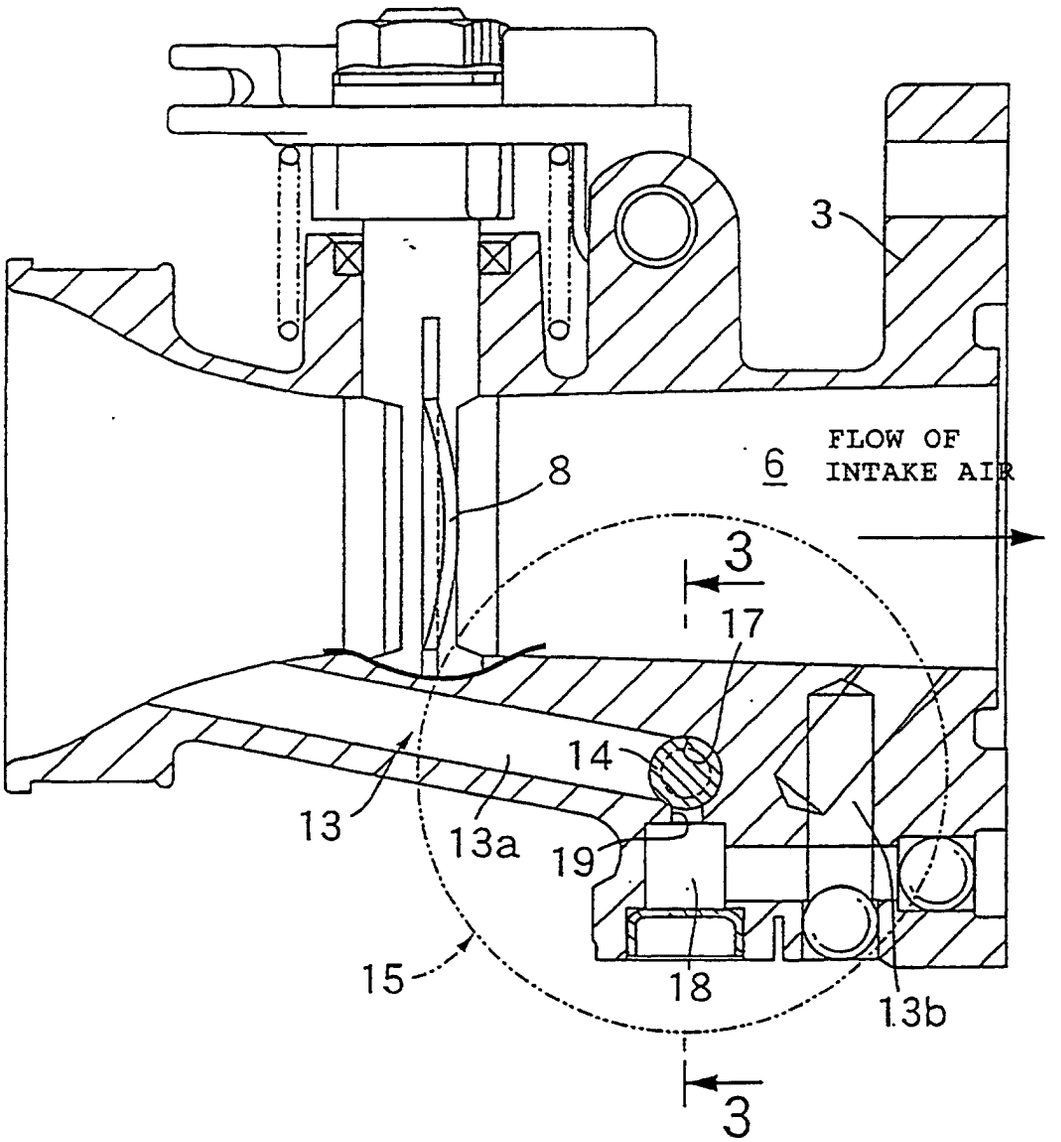
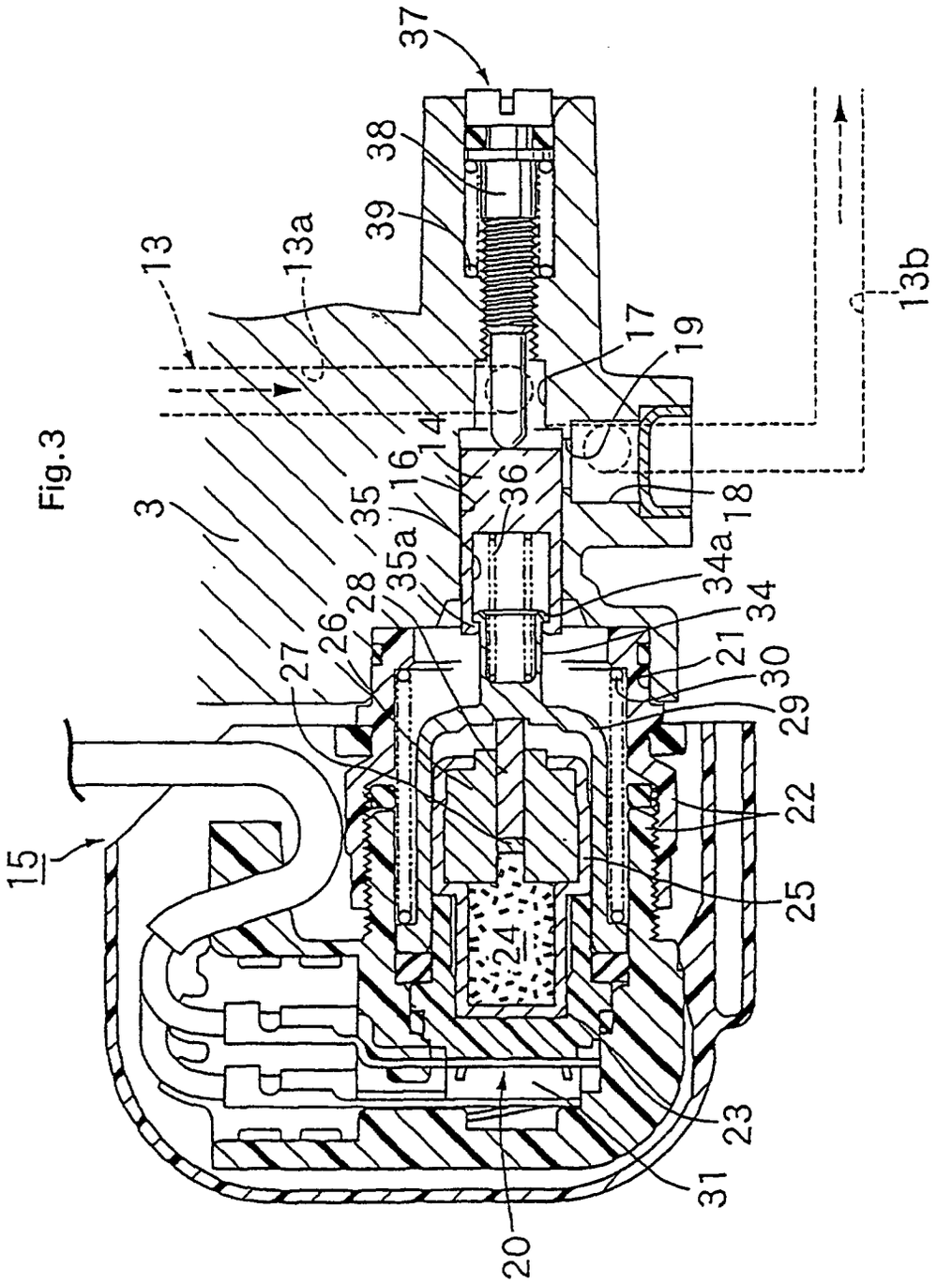


Fig.3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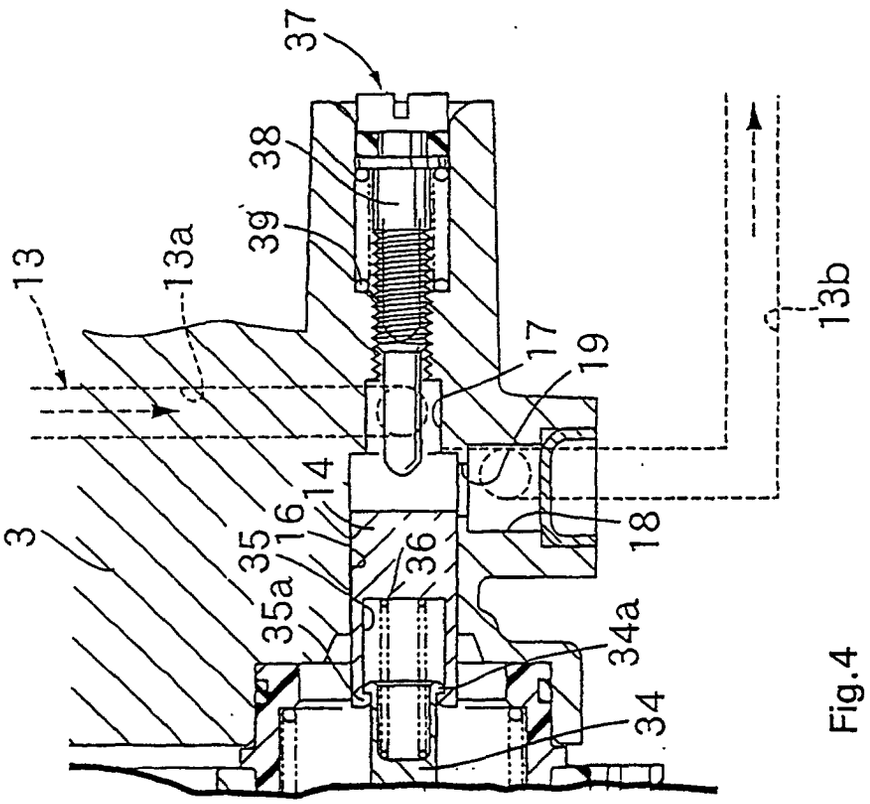

Fig.4

Fig.5