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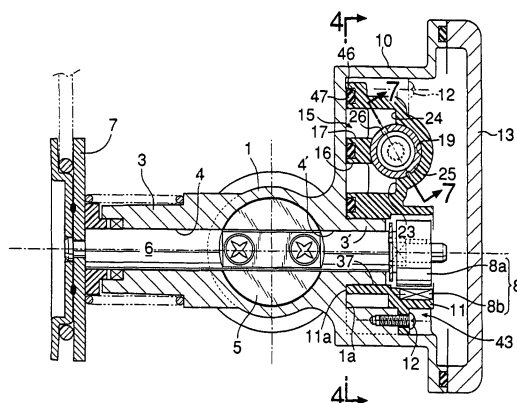
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(54) **ENGINE INTAKE DEVICE**

(57) In an intake system for an engine, a joint surface (11a) of a device block (11) is coupled to a mounting surface (1a) of a throttle body (1) parallel to an intake passage (2), and a bypass passage (15) is comprised of a bypass inlet bore (20) provided to permit the communication between an upstream portion of the intake passage (2) and the mounting surface (1a), a bypass outlet bore (21) provided to permit the communication between a downstream portion of the intake passage (2) and the mounting surface (1a), an upstream groove (16) defined in the joint surface (11a), a downstream

groove (17) defined in the joint surface (11a), and a valve chest (22) provided to permit the communication between the upstream groove (16) and the downstream groove (17). The bypass valve (25) facing the valve chest (22) and an actuator (28) are disposed in the device block (11) in parallel to the joint surface (11a), and a throttle sensor (8) is disposed in the device block (11). Thus, it is possible to compactly construct the intake system of the engine including the bypass valve and the actuator for the bypass valve, leading to enhancements in workability and assemblability.

FIG.3



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Description

FIELD OF THE INVENTION

[0001] The present invention relates to an intake system for an engine, and particularly, to an improvement in an intake system in which a bypass passage is connected to an intake passage defined in a throttle body and provided with a throttle valve, and extends around the throttle valve, and an actuator is connected to a bypass valve for opening and closing the bypass passage to open and close the bypass valve.

BACKGROUND ART

[0002] Such an intake system for an engine is already known, as disclosed, for example, in Japanese Utility Model Publication No.6-45654.

[0003] In the conventional intake system for the engine, the entire bypass passage is defined in the throttle body, and the bypass valve and the actuator are mounted to the throttle body. Therefore, the conventional system is accompanied with the following drawbacks: a complicated processing or working is required for the throttle body and moreover, all of parts must be assembled to the throttle body itself, resulting in a poor assemblability.

DISCLOSURE OF THE INVENTION

[0004] The present invention has been accomplished with such circumstances in view, and it is an object of the present invention to provide an intake system of the above-described type for an engine, wherein the workability and assemblability are improved, and the intake system can be constructed compactly.

[0005] To achieve the above object, according to a first aspect and feature of the present invention, there is provided an intake system for an engine, in which a bypass passage is connected to an intake passage defined in a throttle body and provided with a throttle valve, and extends around the throttle valve, and an actuator is connected to a bypass valve for opening and closing the bypass passage to open and close the bypass valve, characterized in that a joint surface of a device block is coupled to a mounting surface formed on the throttle body in parallel to an axis of the intake passage; the bypass passage is comprised of a bypass inlet bore made in the throttle body to permit the communication between the intake passage upstream of the throttle valve and the mounting surface, a bypass outlet bore made in the throttle body to permit the communication between the intake passage downstream of the throttle valve and the mounting surface, an upstream groove defined in the joint surface and leading to the bypass inlet bore with an open surface thereof closed by the mounting surface, a downstream groove defined in the joint surface and leading to the bypass outlet bore with

an open surface thereof closed by the mounting surface, a valve chest inlet bore which opens into a groove bottom of a downstream end of the upstream groove, a valve chest outlet bore which opens into a groove bottom of an upstream end of the downstream groove, and a valve chest provided in the device block to permit the communication between the valve chest inlet bore and the valve chest outlet bore; the bypass valve facing the valve chest and the actuator for opening and closing the bypass valve are disposed in the device block in parallel to the joint surface; and a throttle sensor for detecting an opening degree of the throttle valve is disposed in the device block.

[0006] With the first feature, the labor of processing or working for the throttle body is reduced, and a device block assembly comprising the device block, bypass valve, actuator, throttle sensor and the like can be fabricated in parallel to the throttle body, thereby contributing to an enhancement in productivity.

[0007] Especially, the upstream groove, the downstream groove, the valve chest inlet bore and the valve chest outlet bore forming principal portions of the bypass passage can be formed at a stroke in the joint surface of the device block by stamping and hence, the fabrication is extremely easy. Moreover, the bypass valve and the actuator are disposed in parallel to the joint surface of the device block and hence, the upstream and downstream grooves and the bypass valve as well as the actuator can be provided in the relatively thin device block so that they can be disposed in proximity to each other. Therefore, the overhanging of the device block from the throttle body can be reduced, leading to the compactness of the entire intake system.

[0008] Further, if the device block is removed from the throttle body, the maintenance of the bypass passage, the bypass valve, the throttle sensor and the like can be carried out easily.

[0009] Yet further, it is possible to easily provide an intake system for an engine having a different specification, while using the same throttle body, by changing the specifications of the bypass valve in the device block and the actuator, leading to an enhancement in mass productivity of the throttle body.

[0010] According to a second aspect and feature of the present invention, in addition to the first feature, the device block has a valve guide bore provided therein in parallel to the joint surface, and the bypass valve of a piston type is slidably received in the valve guide bore to define the valve chest at a tip end thereof, and is disposed so that an axis thereof has a gradient ascending slightly toward the actuator in a state in which the throttle body has been mounted to the engine for a vehicle.

[0011] With the second feature, in the state in which the throttle body has been mounted to the engine, the bypass valve and actuator have only the slight gradient near the horizontal plane. Therefore, even if a vertical vibration is applied with traveling of the vehicle, such vibration cannot be applied violently to a connection be-

tween the bypass valve and the actuator, and it is possible to avoid the wearing due to the vibration of the connection to stabilize the metering performance of the bypass valve.

[0012] Moreover, the gradient provided to the bypass valve and the actuator is such that the actuator is located at a higher level. Therefore, even if a fluid foreign matter such as oil, water and the like in a blow-by gas and an EGR gas enters into the valve chest of the bypass passage through the intake passage during operation of the engine, the foreign matter cannot be raised toward the step motor and hence, it is possible to previously prevent the defective operation of the actuator due to the freezing or accumulation of the foreign matter.

[0013] According to a third aspect and feature of the present invention, in addition to the second feature, the bypass valve is provided with a recess which opens into an end face of the bypass valve to form a portion of the valve chest, and a metering notched groove extending in an axial direction of the valve to permit the recess to communicate with the valve chest outlet bore during the low opening degree of the bypass valve.

[0014] With the third feature, in a low opening degree range of the bypass valve, the amount of air drawn into the bypass passage can be controlled finely by the area of the notched groove opening into the valve chest outlet bore.

[0015] According to a fourth aspect and feature of the present invention, in addition to the second or third feature, the actuator comprises a step motor having a rotor connected through a screw mechanism to the bypass valve non-rotatably fitted in the valve guide bore.

[0016] With the fourth feature, the rotation of an output shaft of the step motor can be transmitted as an axial displacement to the piston-type bypass valve, while being reduced by the screw mechanism, whereby the fine adjustment of the opening degree of the bypass valve can be achieved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Fig.1 is a vertical sectional side view of essential portions of an engine for a two-wheeled motor vehicle equipped with an intake system according to an embodiment of the present invention; Fig.2 is a partially cut-away side view of the intake system for the engine; Fig. 3 is a sectional view taken along a line 3-3 in Fig.2; Fig. 4 is a sectional view taken along a line 4-4 in Fig.3; Fig. 5 is a sectional view taken along a line 5-5 in Fig.4; Fig. 6 is a sectional view taken along a line 6-6 in Fig.4; Fig. 7 is a sectional view taken along a line 7-7 in Fig.3; Fig. 8 is a sectional view taken along a line 8-8 in Fig.7; and Fig.9 is a side view of a bypass valve, taken in the direction of an arrow 9 in Fig.8.

BEST MODE FOR CARRYING OUT THE INVENTION

[0018] The best mode for carrying out the present in-

vention will now be described by way of an embodiment of the present invention shown in the accompanying drawings.

[0019] First, in Fig.1, reference character E designates an engine mounted on a vehicle body of a two-wheeled motor vehicle. An intake pipe Ei connected to a cylinder Eh of the engine E has a gradient θ with its upstream side located at a slightly higher level. A throttle body 1 is connected to an upstream end of the intake pipe Ei and has an intake passage 2 connected to the inside of the intake pipe Ei. Therefore, with the throttle body 1 connected to the intake pipe Ei, the intake passage 2 is disposed to have a gradient θ with its upstream side located at a slightly higher level, as is the intake pipe Ei. An upstream end of the intake passage 2 is of a funnel shape, and an air cleaner (not shown) is connected to the upstream end of the intake passage 2. A fuel injection valve I for injecting fuel toward an intake valve is mounted to the cylinder Eh.

[0020] Referring to Figs.2 and 3, a pair of bosses 3 and 3' are formed on opposite sides of an intermediate portion of the throttle body 1 and have shaft bores 4 and 4' perpendicular to an axis of the intake passage 2, respectively, and a butterfly-type throttle valve 5 for opening and closing the intake passage 2 is secured to a valve shaft 6 rotatably received in the shaft bores 4 and 4'. A throttle drum 7 for connecting an operating wire 9 leading to a throttle operating member (not shown) is secured to one end of the valve shaft 6. A rotor 8a of a throttle sensor 8 for detecting the opening degree of the throttle valve 5 is secured to the other end of the valve shaft 6.

[0021] A housing 10 is integrally formed at one end of the throttle body 1 and has a bottom surface 1a located in proximity to the intake passage 2 and parallel to the axis of the intake passage 2. The other boss 3' protrudes on the bottom surface 1a of the housing 10, and the shaft bore 4' in the boss 3' and the bottom surface 1a are disposed to be perpendicular to each other. The bottom surface 1a of the housing 10 is a mounting surface. A joint surface 11a of a device block 11 accommodated in the housing 10 is superposed onto the mounting surface 1a, and the device block 11 is secured to the throttle body 1 by a bolt 12. A lid plate 13 is secured to an open surface of the housing 10 by a bolt 14 to air-tightly close the open surface.

[0022] A first accommodation bore 37 for accommodation of the other boss 3' and the rotor 8a is defined in the device block 11, and a pickup coil 8b is mounted to an inner wall of the first accommodation bore 37. The pickup coil 8b forms the throttle sensor 8 for electrically detecting the opening degree of the throttle valve 5 by cooperation with the rotor 8a.

[0023] As shown in Figs. 2 to 6, a bypass passage 15 is defined to extend from the throttle body 1 to the device block 11. The bypass passage 15 is comprised of a bypass inlet bore 20 (see Figs.4 and 5) made in the throttle body 1 to permit the communication between the

intake passage 2 and the mounting surface 1a at a location upstream of the throttle valve 5, a bypass outlet bore 21 (see Figs. 4 and 6) made in the throttle body 1 to permit the communication between the intake passage 2 and the mounting surface 1a at a location downstream of the throttle valve 5, an upstream groove 16 defined in the joint surface 11a of the device block 11 and leading at one end thereof to the bypass inlet bore 20, a downstream groove 17 likewise defined in the joint surface 11a of the device block 11 and leading at one end thereof to the bypass outlet bore 21, a valve chest inlet bore 23 which opens into a groove bottom of a downstream end of the upstream groove 16, a valve chest outlet bore 24 which opens into a groove bottom of an upstream end of the downstream groove 17, and a valve chest 22 in a cylindrical valve guide bore 19 defined in the throttle body 1 to permit the communication between the valve chest inlet bore 23 and the valve chest outlet bore 24. In this manner, the bypass passage 15 is connected to the intake passage 2 so as to extend around or bypass the throttle valve 5.

[0024] In this case, the bypass inlet bore 20, the bypass outlet bore 21 and the shaft bores 4 and 4' are disposed in parallel to one another, so that they can be made at a stroke by a multi-spindle drilling machine. The valve chest outlet bore 24 is disposed offset upwards with respect to the valve chest inlet bore 23 and toward the bypass inlet bore 20, as shown in Fig. 4. The cylindrical valve guide bore 19 is disposed so that it is parallel to the intake passage 2 and in proximity to the upstream groove 16 and the downstream groove 17, and so that the valve chest 22 overlaps with both of the valve chest inlet bore 23 and the valve chest outlet bore 24. In this way, the valve guide bore 19 is disposed in parallel to the intake passage 2 and hence, in a state in which the throttle body 1 has been connected to the intake pipe Ei, the throttle body 1 is provided with the slight gradient θ as is the intake passage 2 (see Fig.2) with the valve chest 22 located at a lower level.

[0025] As shown in Figs.7 and 8, a piston-type bypass valve 25 is slidably received in the valve guide bore 19, and the valve chest 22 is defined in the valve guide bore 19 by a tip end of the valve 25. To prevent the rotation of the bypass valve 25, a key 42 integrally and projectingly provided on an inner peripheral surface of the valve guide bore 19 is engaged into a key groove 41 in an outer periphery of the bypass valve 25.

[0026] Provided in the bypass valve 25 are a recess 25a which opens into an end face of the bypass valve 25 adjacent the valve chest 22 to form a portion of the valve chest 22, and a metering notched groove 26 which permits the recess 25a to communicate with the valve chest outlet bore 24. In a lower opening degree range of the bypass valve 25, the area of the notched groove 26 opening into the valve chest outlet bore 24 is controlled, so that the amount of air drawn into the bypass passage is finely adjusted. In a higher opening degree range, the area of the valve chest outlet bore 24

opening into the valve chest 22 is controlled by the end face of the bypass valve 25, so that the amount of air drawn into the bypass passage is adjusted relatively largely.

[0027] A step motor 28 is disposed coaxially with the bypass valve 25 above the bypass valve 25 along the gradient θ (see Fig.2), and has a rotor 28a connected to the bypass valve 25 through a screw mechanism 27. More specifically, an operating member 32 having a threaded bore 31 is non-rotatably fitted into a central portion of the bypass valve 25, and a threaded shaft 30 integrally coupled to the rotor 28a is threadedly fitted into the threaded bore 31 in the operating member 32. The step motor 28 has a stator 28b accommodated and fixed in a second accommodation bore 38 in the device block 11, which leads to the valve guide bore 19.

[0028] An expanded portion 32a is formed at one end of the operating member 32 to abut against a ceiling surface of the recess 25a in the bypass valve 25, and a clip 35 is locked at the other end of the operating member 32. A coil spring 45 is mounted under compression between the clip 35 and the bypass valve 25 for biasing the bypass valve 25 in a direction of abutment against the shoulder 32a. Thus, the operating member 32 is connected integrally to the bypass valve 25.

[0029] Referring again to Figs. 4 to 6, a seal groove 46 is defined in the joint surface 11a of the device block 11 to surround the upstream groove 16 and the downstream groove 17, and a seal member 47 is mounted in the seal groove 46, so that when the joint surface 11a is superposed onto the mounting surface 1a of the throttle body 1, the seal member 47 is brought into close contact with the mounting surface 1a. In this manner, open surfaces of the grooves 16 and 17 are air-tightly closed by the mounting surface 1a.

[0030] Third and fourth accommodation bores 39 and 40 open into an outer surface of the device block 11 opposite from the joint surface 11a. The fourth accommodation bore 40 communicates with a downstream portion of the intake passage 2 through a communication groove 50 in the device block 11 and an orifice 49 in the throttle body 1. An intake air temperature sensor 34 is mounted in the third accommodation bore 39 with its sensing portion 34a facing the upstream groove 16, and a boost vacuum sensor 33 is mounted in the fourth accommodation bore 40 with its sensing portion 33a facing the communication groove 50.

[0031] Information regarding conditions for the operation of the engine such as a throttle valve opening degree θ_{th} , a boost vacuum P_b and an intake air temperature T_a which are detected by the throttle sensor 8, the boost vacuum sensor 33 and the intake air temperature sensor 34, respectively, as well as an engine temperature T_e detected by an engine-cooling water temperature sensor (not shown) and the like, is input to an electronic control unit 36 connected to the step motor 28.

[0032] A device block assembly 43 is constructed by mounting the bypass valve 25, the step motor 28, the

pickup coil 8b, the boost vacuum sensor 23 and the intake air temperature sensor 34 to the device block 11.

[0033] The operation of the present embodiment will be described below.

[0034] When the throttle valve 5 is in a fully closed state, the electronic control unit 36 calculates an amount of current supplied to the step motor 28 based on the information regarding conditions for operation of the engine such as the throttle valve opening degree θ_{th} , the boost vacuum P_b , the intake air temperature T_a , the engine temperature T_e and the like input as described above, and carries out the supplying of current to rotate the rotor 28a in a normal direction or in a reverse direction in order to provide an optimal opening degree of the bypass valve 25 corresponding to the operating condition for the engine such as during starting, first idling and usual idling of the engine and during application of an engine brake. When the rotor 28a is rotated or reversed, the rotation of the rotor 28a is transmitted as an axial displacement to the piston-type bypass valve 25, while being reduced by the screw mechanism 27 and hence, the fine adjustment of the opening degree the bypass valve 25 can be achieved.

[0035] When the bypass valve 25 assumes a high opening degree position closer to the step motor 28, the end face of the bypass valve 25 faces the valve chest outlet bore 24 and hence, the amount of air flowing through the bypass passage 15 and drawn into the engine can be controlled to a relatively large value by the area of the valve chest outlet bore 24 opening into the valve chest 22 to accommodate to the starting or the first idling of the engine. When the bypass valve 25 assumes a low opening degree position closer to the valve chest 22, the notched groove 26 of the bypass valve 25 faces the valve chest outlet bore 24 and hence, the amount of air flowing through the bypass passage 15 can be controlled to a relatively small value and finely by the area of the notched groove 26 opening into the valve chest outlet bore 24 to accommodate to the usual idling of the engine or the application of the engine brake.

[0036] When the throttle valve 5 is gradually opened, an amount of air corresponding to the opening degree of the throttle valve 5 is supplied to the engine through the intake passage 2, whereby the engine is shifted into a power-output operational range.

[0037] In such intake system, the device block assembly 43 is constructed by mounting the bypass valve 25, the step motor 28, the pickup coil 8b, the boost vacuum sensor 23 and the intake air temperature sensor 34 to the device block 11 detachably mounted to the housing 10 integral with the throttle body 1. Therefore, the labor of processing or working for the throttle body 1 is reduced, and the device block assembly 43 can be fabricated in parallel to the throttle body 1, leading to an enhancement in productivity. Moreover, the maintenance of the bypass passage 15, the bypass valve 25, the throttle sensor 8 and the like can be carried out easily

by removing the device block 11 from the throttle body 1. Further, it is possible to easily provide an intake system for an engine having a different specification, while using the same throttle body 1, by changing the specifications of the bypass valve 25, the step motor 28 and the various sensors 8, 33 and 34 in the device block 11, leading to an enhancement in mass productivity of the throttle body 1. Yet further, the intake system has general-purpose properties as described above and hence, the degree of freedom of the layout of the intake system can be increased, and moreover, the mass productivity can be enhanced to provide a reduction in cost.

[0038] The upstream groove 16, the downstream groove 17, the valve chest inlet bore 23 and the valve chest outlet bore 24 constituting principal portions of the bypass passage 15 can be formed at a stroke in the joint surface 11a of the device block 11 by stamping and hence, the fabrication is extremely easy. Moreover, the valve guide bore 19 permitting the communication between the valve chest inlet bore 23 and the valve chest outlet bore 24 is disposed in parallel to the joint surface 11a of the device block 11 and hence, the upstream and downstream grooves 16 and 17 and the valve guide bore 19 can be formed in the relatively thin device block, so that they are disposed in proximity to each other. Therefore, the overhanging of the device block 11 from the throttle body 1 can be reduced, leading to the compactness of the entire intake system.

[0039] In a state in which the throttle body 1 has been mounted to the engine E of the two-wheeled motor vehicle, the bypass valve 25 and the step motor 28 connected to each other through the screw mechanism 27 have only a slight gradient θ near the horizontal plane and hence, even if a vertical vibration is exerted with the traveling of the vehicle, it is not applied violently to a connection between the bypass valve 25 and the step motor 28, i.e., to the screw mechanism 27, and the wear due to the vibration of the mechanism 27 can be avoided to provide a stabilization in metering performance of the bypass valve 25.

[0040] Moreover, the gradient θ provided to the bypass valve 25 and the step motor 28 is such that the step motor 28 is located at a higher level. Therefore, even if fluid foreign matters such as oil, water and the like in a blow-by gas and an EGR gas enters into the valve chest 22 of the bypass passage 15 through the intake passage 2 during operation of the engine, the foreign matter cannot be raised toward the step motor 28 and hence, it is possible to previously prevent the defective operation of the step motor 28 due to the freezing or accumulation of the foreign matter.

[0041] The present invention is not limited to the above-described embodiment, and various modifications in design may be made without departing from the subject matter of the invention.

Claims

1. An intake system for an engine, in which a bypass passage (15) is connected to an intake passage (2) defined in a throttle body (1) and provided with a throttle valve (5), and extends around said throttle valve (5), and an actuator (28) is connected to a bypass valve (25) for opening and closing said bypass passage (15) to open and close said bypass valve (25),

characterized in that a joint surface (11a) of a device block (11) is coupled to a mounting surface (1a) formed on said throttle body (1) in parallel to an axis of said intake passage (2); said bypass passage (15) is comprised of a bypass inlet bore (20) made in said throttle body (1) to permit the communication between the intake passage (2) upstream of said throttle valve (5) and said mounting surface (1a), a bypass outlet bore (21) made in said throttle body (1) to permit the communication between said intake passage (2) downstream of said throttle valve (5) and said mounting surface (1a), an upstream groove (16) defined in said joint surface (11a) and leading to said bypass inlet bore (20) with an open surface thereof closed by said mounting surface (1a), a downstream groove (17) defined in said joint surface (11a) and leading to said bypass outlet bore (21) with an open surface thereof closed by said mounting surface (1a), a valve chest inlet bore (23) which opens into a groove bottom of a downstream end of said upstream groove (16), a valve chest outlet bore (24) which opens into a groove bottom of an upstream end of said downstream groove (17), and a valve chest (22) provided in said device block (11) to permit the communication between said valve chest inlet bore (23) and said valve chest outlet bore (24); said bypass valve (25) facing said valve chest (22) and said actuator (28) for opening and closing said bypass valve (25) are disposed in said device block (11) in parallel to said joint surface (11a); and a throttle sensor (8) for detecting an opening degree of said throttle valve (5) is disposed in said device block (11).

2. An intake system for an engine according to claim 1, wherein

said device block (11) has a valve guide bore (19) provided therein in parallel to said joint surface (11a), and said bypass valve (25) of a piston type is slidably received in said valve guide bore (19) to define said valve chest (22) at a tip end thereof, and is disposed so that an axis thereof has a gradient (θ) ascending slightly toward said actuator (28) in a state in which said throttle body (1) has been mounted to an engine (E) for a vehicle.

3. An intake system for an engine according to claim 2, wherein

said bypass valve (25) is provided with a recess (25a) which opens into an end face of said bypass valve (25) to form a portion of said valve chest (22), and a metering notched groove (26) extending in an axial direction of said bypass valve (25) to permit the recess (25a) to communicate with said valve chest outlet bore (24) during the low opening degree of said bypass valve (25).

4. An intake system for an engine according to claim 2 or 3, wherein

said actuator comprises a step motor (28) having a rotor (28a) connected through a screw mechanism (27) to said bypass valve (25) non-rotatably fitted in said valve guide bore (19).

FIG. 1

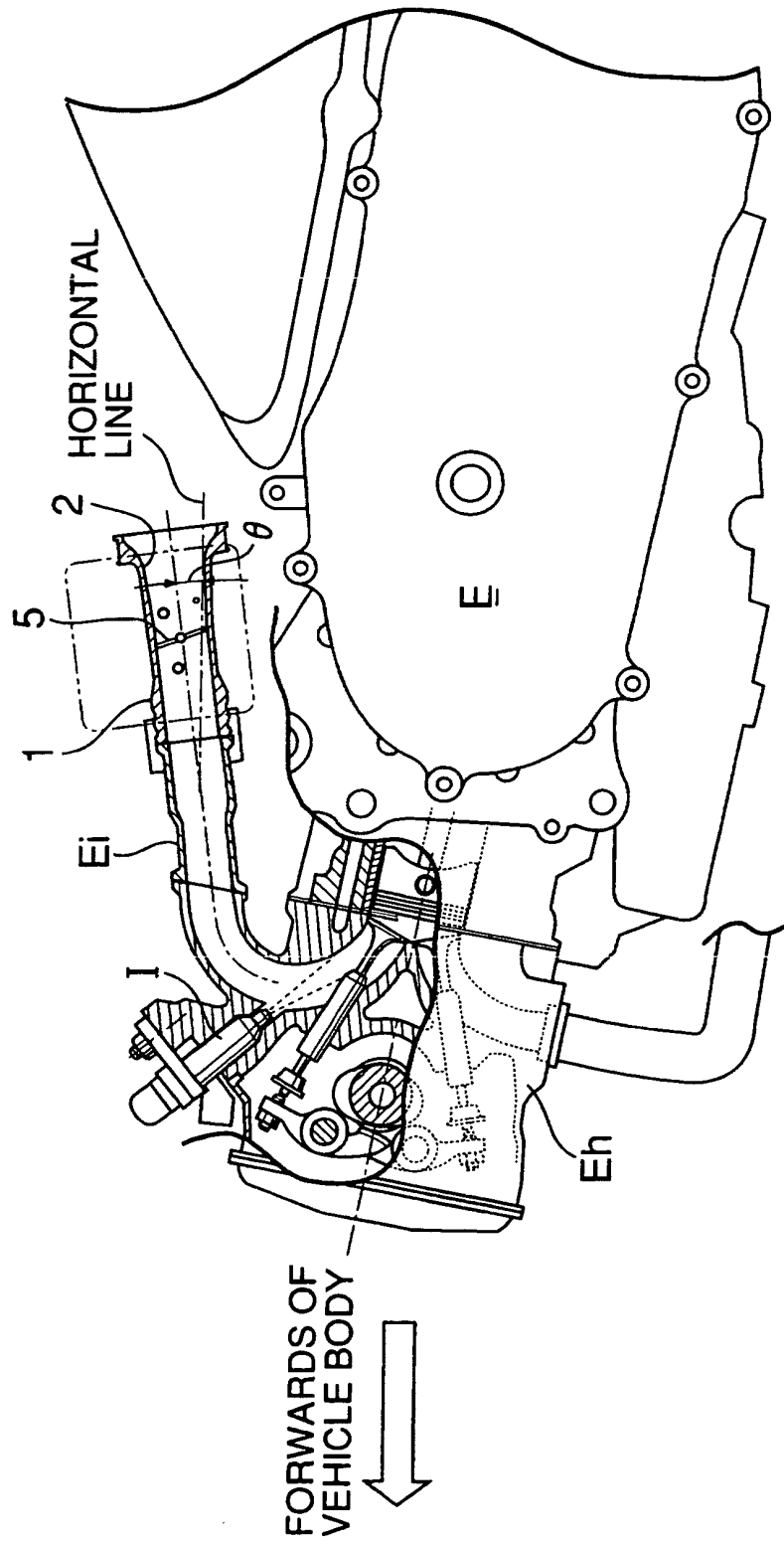


FIG. 2

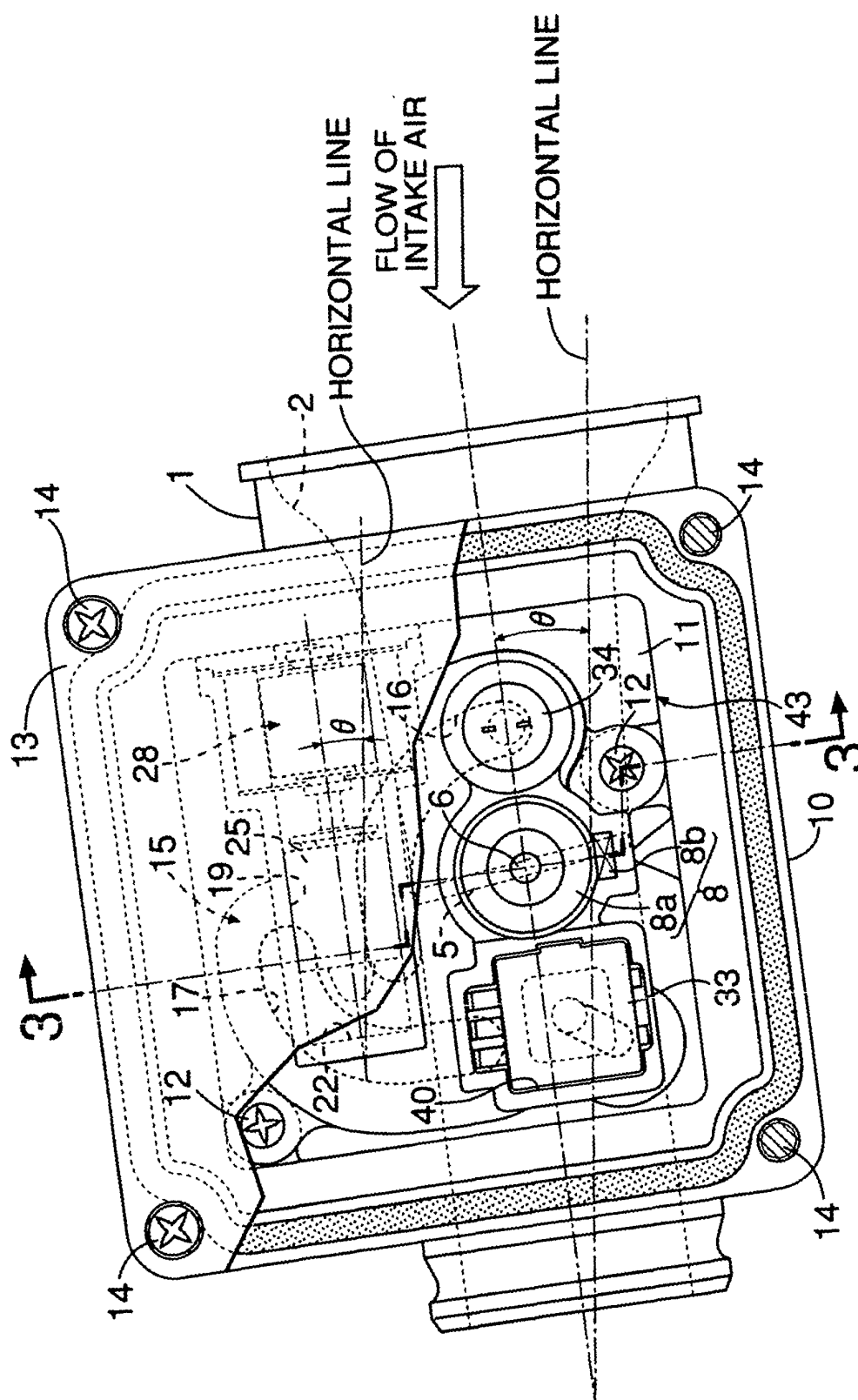


FIG.3

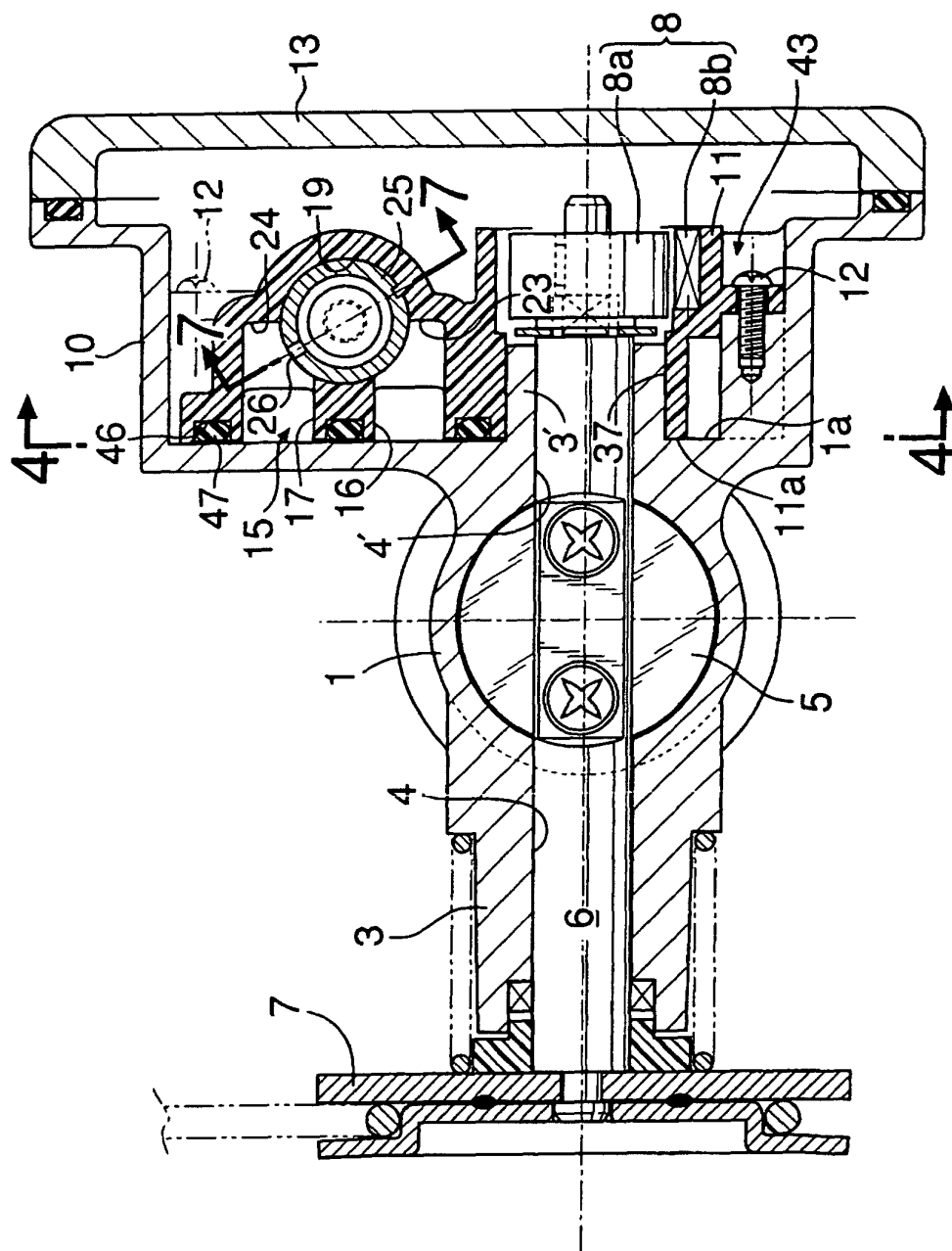


FIG.4

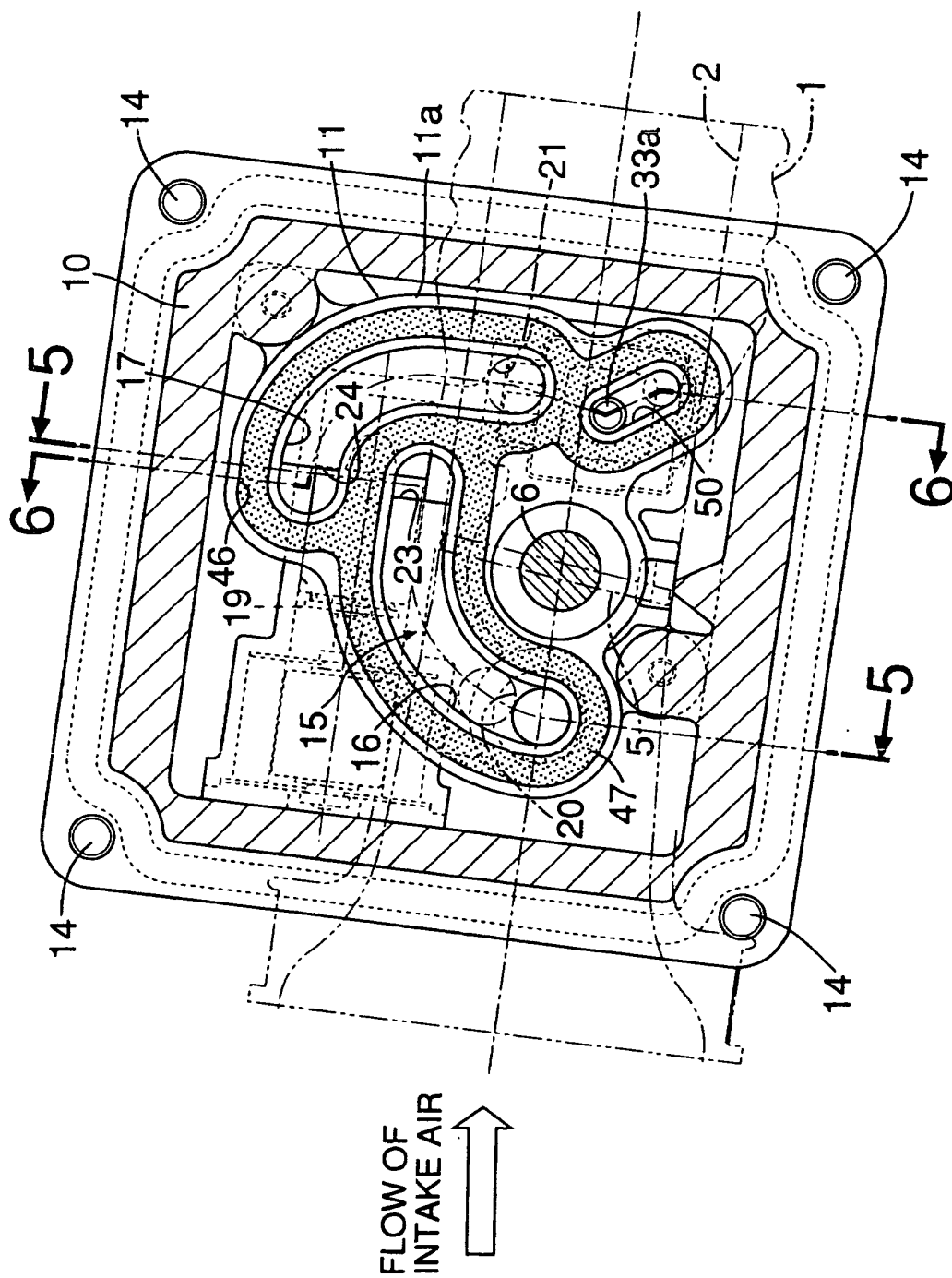


FIG.5

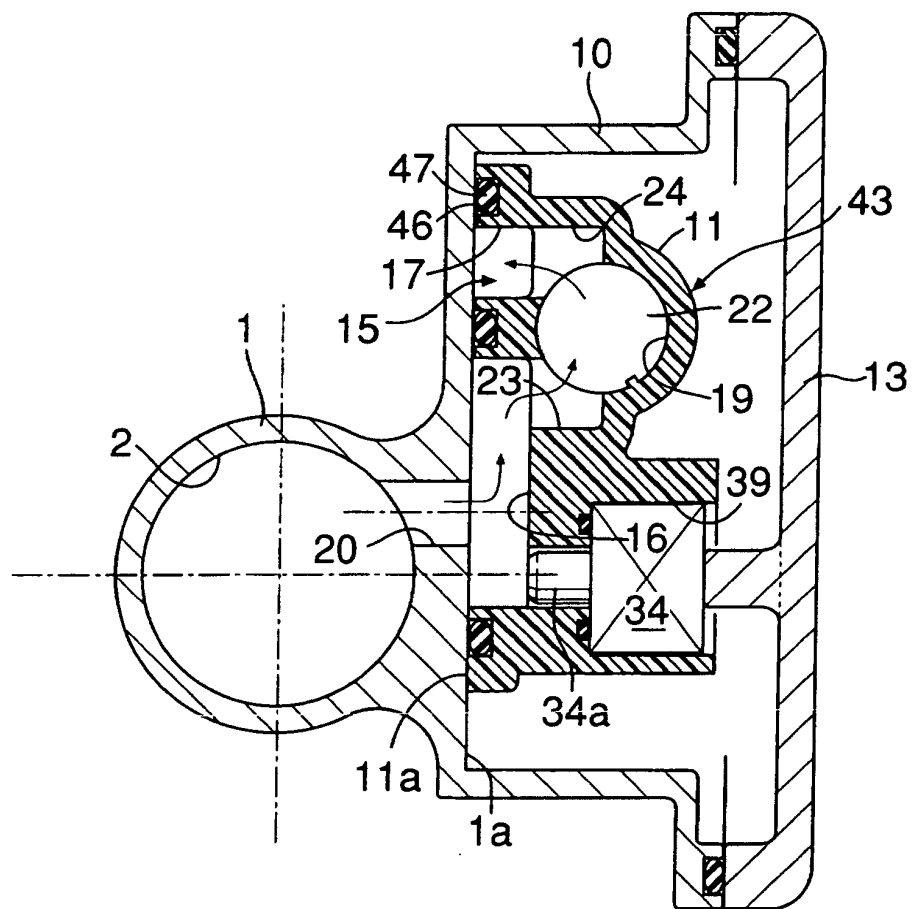


FIG.6

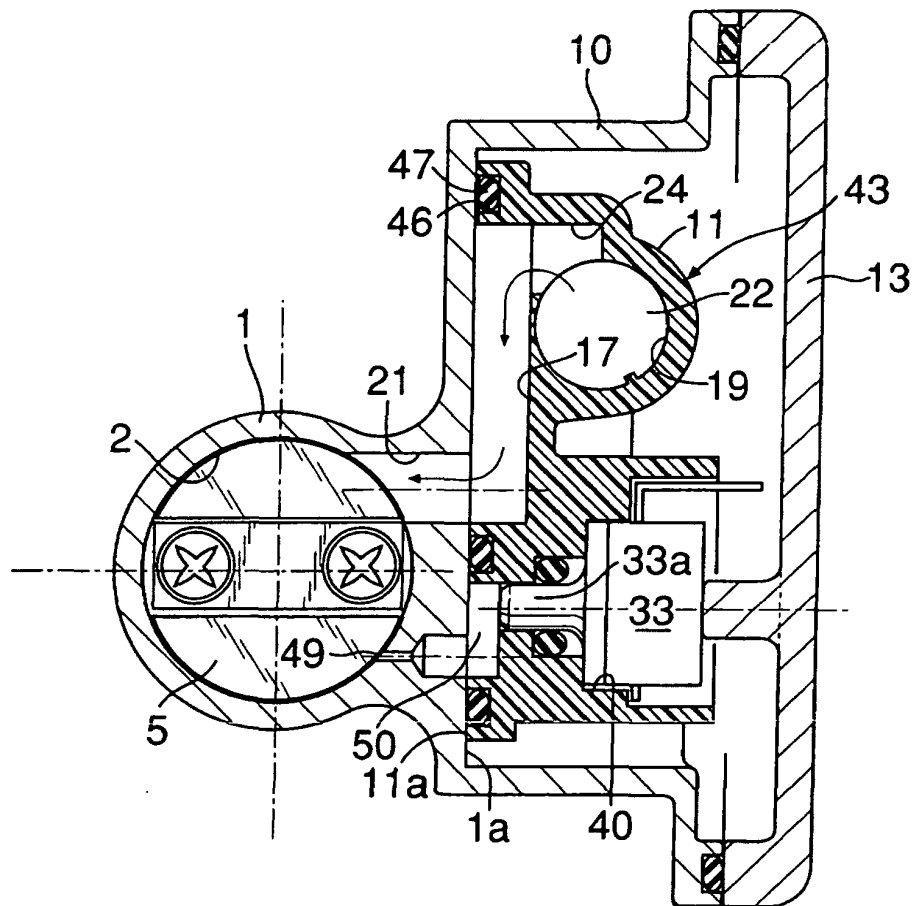


FIG. 7

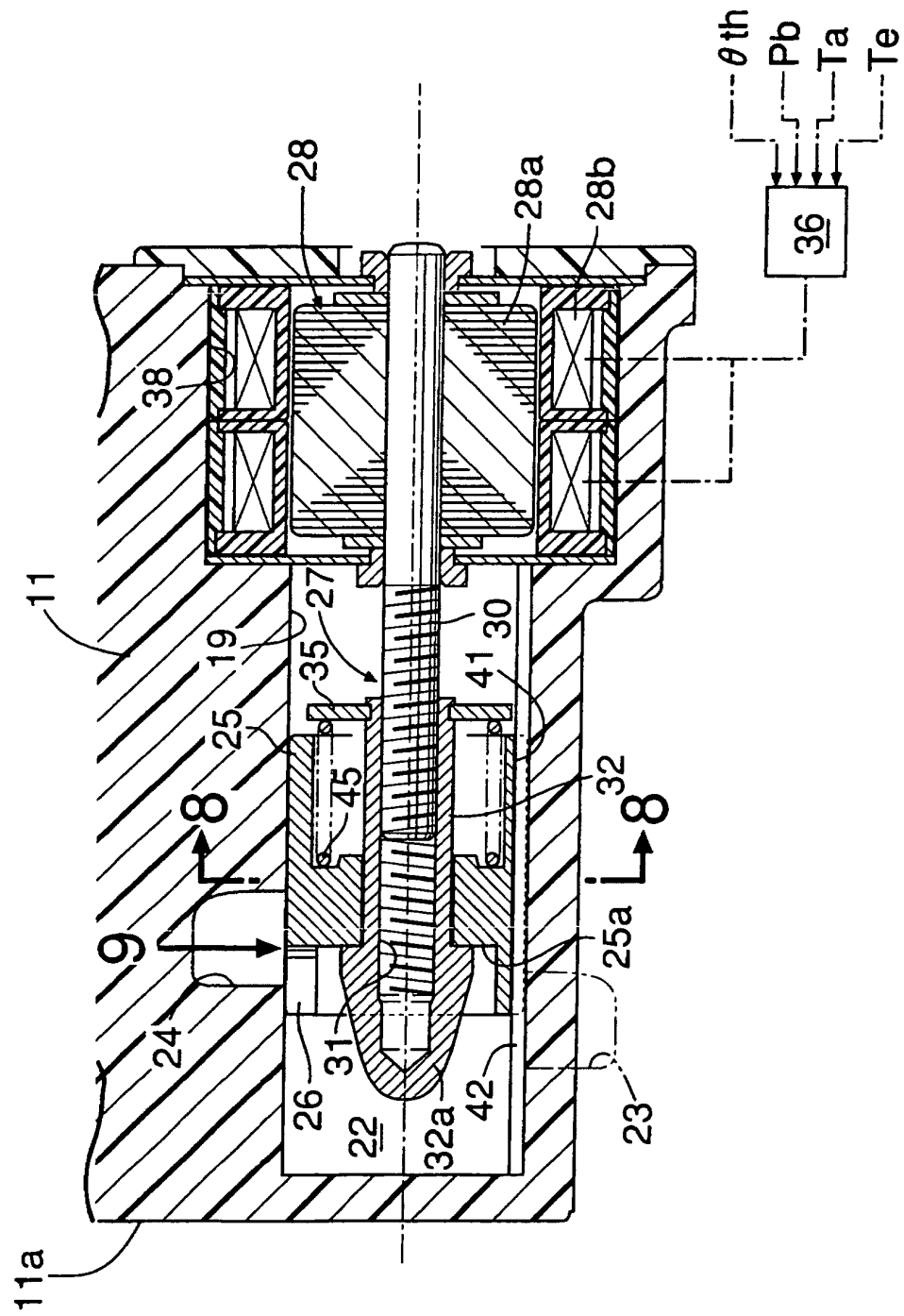


FIG.8

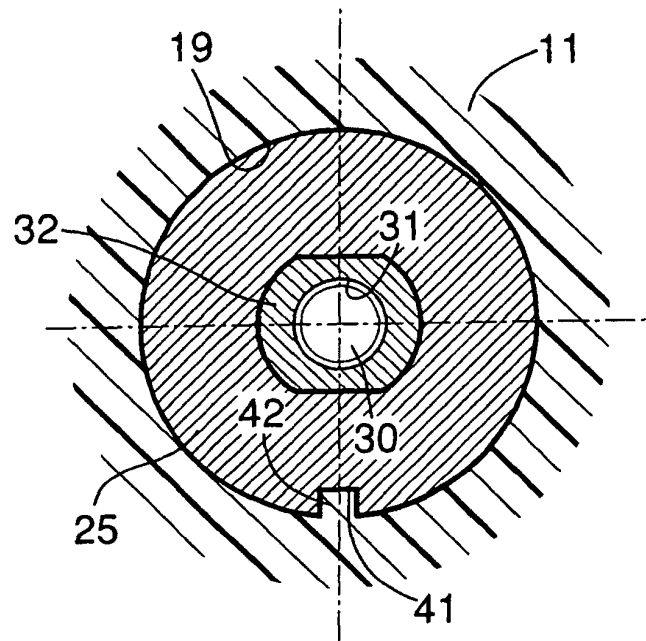
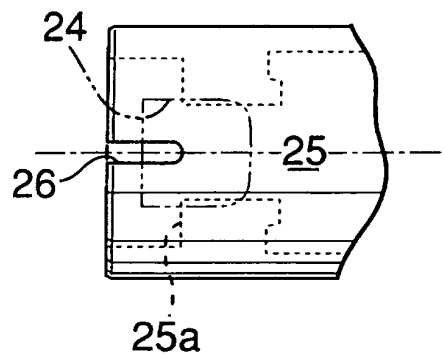


FIG.9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/03948

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl⁷ F02D33/00, F02D35/00, F02D9/10

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl⁷ F02D33/00, F02D35/00, F02D9/10

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

Jitsuyo Shinan Koho	1922-1996	Toroku Jitsuyo Shinan Koho	1994-2002
Kokai Jitsuyo Shinan Koho	1971-2002	Jitsuyo Shinan Toroku Koho	1996-2002

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5711271 A (Walter Schlagmueller et al.), 27 January, 1998 (27.01.98), Full text; Figs. 1 to 5 & DE 19516584 A & WO 96/035047 A1 & EP 791133 A & JP 10-512032 A & CZ 9700022 A & BR 9606355 A & ES 2127626 T	1-4
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 44138/1984 (Laid-open No. 157947/1985) (Japan Electronic Control Systems Co., Ltd.), 21 October, 1985 (21.10.85), Full text; Figs. 1 to 4 (Family: none)	1-4

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

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Date of the actual completion of the international search

01 August, 2002 (01.08.02)

Date of mailing of the international search report

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 29303/1987 (Laid-open No. 136236/1988) (Mitsubishi Electric Corp.), 07 September, 1988 (07.09.88), Full text; Figs. 1, 2 (Family: none)	1-4

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