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(54) **FLUID CONTROL DEVICE WITH A FLUID DISCHARGE STRUCTURE**

FLÜSSIGKEITSSTEUERUNGSVORRICHTUNG MIT EINER FLÜSSIGKEITSAUSTRITTSSTRUKTUR

DISPOSITIF DE COMMANDE DE FLUIDE AVEC UNE STRUCTURE DE DÉCHARGE DE FLUIDE

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Description

[0001] The present invention relates to a fluid control device with a fluid discharge structure that can be suitably used for air bleeding, water removal, oil removal and the like in a fluid control device comprising a thermostat that performs switching by opening and closing a flow passage based on the fluid temperature and which is used, for example, in a coolant circuit of a coolant for cooling an internal-combustion engine (hereinafter simply referred to as an "engine") that is used in automobiles and the like.

[0002] A coolant-based cooling system that uses a radiator is generally used, for instance, to cool an automobile engine. This type of cooling system uses a thermostat that employs a thermal expansion body for adjusting the amount of coolant to be circulated on the radiator side in order to control the temperature of the coolant to be introduced into the engine.

[0003] However, with this kind of cooling system, in order to overcome the drawback of having to adjust the positional relationship in the height direction of the radiator cap, which is provided to the upper tank of the radiator, and the engine for eliminating air pockets in the tubing upon filling the coolant, a structure which provides an air bleeding cock at the upper part of the housing of the thermostat has been conventionally used in order to prevent cavitation caused by the air pockets in the coolant tubing and to prevent air from getting sucked into the water pump (for instance, refer to Japanese unexamined Patent Application No. S59-18224).

[0004] Nevertheless, with this kind of conventional structure, since a screw-operated type is used as the air bleeding cock, a tool or the like is required during the air bleeding process, and the air bleeding operation is troublesome and complicated. In addition, there were cases where the coolant would be discharged outside or air would enter the coolant passage as a result of the cock loosening due to the vibration of the engine or the like.

[0005] Moreover, with a screw-operated cock, it is necessary to provide a thread to the housing based on cutting work or the like, and this led to increased production costs. In addition, there was also a problem in that the 0-ring for sealing would sometimes get cut as a result of being caught in the thread groove or the transverse passage.

[0006] These problems similarly occur upon discharging fluid outside from a fluid passage in various fluid control devices, and there are demands for some kind of measure to be taken in light of the foregoing points.

[0007] Further prior art is disclosed in document US 5 853 071 A. This document discloses a fluid control device with a fluid discharge structure according to the preamble of claim 1.

[0008] The present invention was devised in view of the foregoing circumstances. Thus, an object of this invention is to provide a fluid discharge structure for a fluid control device configured to enable fluid discharge such as air bleeding, water removal, and oil removal simply and reliably by providing to a part of the fluid control device, which opens and closes the flow path and performs switching based on the fluid temperature, a simply-structured fluid discharge part such as an air bleeding part for bleeding air from a coolant passage of an engine, a water removing part for removing water, or an oil removing part for removing oil if the fluid control device is to be provided to an oil circulation circuit.

[0009] In order to achieve the foregoing object, the fluid control device with the fluid discharge structure according to the present invention (invention claimed in claim 1) includes a fluid discharge part provided to a part of a housing, wherein the fluid discharge part is composed of a cock retention hole formed to open at a part of the housing, a fluid discharge cock that is slidably retained in the cock retention hole and in which a cock outer end is subjected to pressing operation from an outside of the housing, a fluid discharge hole that opens from a part of the cock retention hole in a longitudinal direction to the outside of the housing, and spring means provided inside the housing for constantly causing the fluid discharge cock to be biased upward for protruding the cock outer end outward from the housing, and wherein the fluid discharge cock and the cock retention hole together configure a fluid discharge circuit which normally blocks communication between a fluid passage inside the housing and the fluid discharge hole by the fluid discharge cock being biased outward by the spring means, and allows the fluid passage inside the housing to communicate with the fluid discharge hole when the cock outer end is subjected to pressing operation and pushed into the cock retention hole against a biasing force of the spring means.

[0010] According to claim 1, the fluid control device with the fluid discharge structure is further characterized in that the fluid control device comprises a main valve and has a thermoelement built into the housing, and in that the main valve or the thermoelement of the fluid control device is biased with the spring means used for biasing the fluid discharge cock.

[0011] As explained above, according to the fluid discharge structure for a fluid control device according to the present invention, although it is of a simple configuration, for instance, a tool is not required when filling a fluid in the fluid control device such as upon filling a coolant, and the fluid discharge cock can be easily operated merely by performing pressing operation from the outside of the housing, and fluid discharge such as air bleeding, water removal, and oil removal can be performed simply and reliably, whereby the user-friendliness is improved.

[0012] Moreover, since the present invention does not employ a screw-operated cock, for instance, it is possible to prevent the coolant from being discharged outside or air entering the coolant passage as a result of the cock loosening due to the vibration of the engine or the like.

[0013] In addition, with a screw-operated cock, there is a problem that the 0-ring for sealing would sometimes get cut as a result of being caught in the thread groove

or the transverse passage, but the present invention is free from such problems.

[0014] Furthermore, with a screw-operated cock, it is necessary to perform cutting work to the thread, but such cutting work is not required in the present invention. In addition, since the cock of the present invention can be formed of resin, it is possible to lower production costs.

[0015] Moreover, since the present invention is configured such that the fluid discharge cock is biased with a spring that is used for biasing the main valve or thermoelement of the device to the cap, it is not necessary to prepare separate spring means for the fluid discharge cock, the total number of components can be reduced, and weight-saving and miniaturization can be sought.

Fig. 1 shows an embodiment of the fluid discharge structure for a fluid control device according to the present invention, and is a schematic cross section in the case of applying this to the air bleeding structure in a thermostat, and a schematic cross section in the case of opening the air bleeding cock of the thermostat;

Fig. 2 is a schematic cross section showing the normal state where the air bleeding cock is closed in the thermostat of Fig. 1; and

Fig. 3A and Fig. 3B are respectively a schematic side view and a bottom view of the thermostat of Fig. 1 and Fig. 2.

[0016] 10... thermostat, 11... housing, 12... cap, 13... entrance-side cylindrical part, 14... exit-side cylindrical part, 15... coolant passage, 16... cylindrical space, 21... thermoelement, 22... guide, 23... piston, 24... rib, 25... spring means, 26... communication hole, 30... air bleeding part, 31... cock retention hole, 32... air bleeding cock (fluid discharge cock), 32a... cock outer end, 33... air bleeding hole, 40... air bleeding circuit, 41... annular space part

[0017] Fig. 1 to Fig. 3 show an embodiment of the fluid discharge structure, air bleeding structure, water removal structure and oil removal structure of the fluid control device according to the present invention, and a case is now explained of applying this to the air bleeding structure in a thermostat of a fluid control device.

[0018] In the drawings, a thermostat 10 is provided to a part of a coolant circuit (not shown) of an engine for controlling the amount of coolant as conventionally known, and comprises a housing 11 provided to the exit side or the like of a water jacket of the engine, and a cap 12 for closing the lower end opening of the housing 11. Also shown are an entrance-side cylindrical part 13 provided to the housing 11 for communicating with the engine side, and an exit-side cylindrical part 14 provided to the cap 12 for communicating with the radiator side (refer to Fig. 3).

[0019] The thermostat 10 comprises a thermoelement 21 that is disposed for opening and closing a coolant passage 15 formed in the housing 11, and the thermoelement 21 is retained to freely move vertically within a cylindrical space 16 in the housing 11. A piston 23 is provided to a lower end of the thermoelement 21 via a guide 22. The piston 23 is pushed in its protruding direction when the coolant temperature in the coolant passage 15 becomes a prescribed temperature or higher, the thermoelement 21 thereby moves upward within the cylindrical space 16, and the coolant flows from the engine side to the radiator side as a result of a cut-off part formed at the step part of the cap 12 being released.

[0020] The drawings also show a rib 24 for retaining the thermoelement 21 in a manner that allows vertical movement within the cylindrical space 16 of the housing 11, and spring means 25 disposed at the upper part of the thermoelement 21 for applying biasing force to the thermoelement 21 normally in the closing direction.

[0021] The present invention is unique in that the air bleeding part 30 is provided to the upper part of the housing 11 of the thermostat 10.

[0022] The air bleeding part 30 is configured from a cock retention hole 31 formed to open at the upper end of the housing 11, an air bleeding cock 32 that is slidably retained in the cock retention hole 31 and in which its outer end 32a is subjected to pressing operation from the outside of the housing 11, an air bleeding hole 33 that causes one longitudinal end of the cock retention hole 31 to be opened to the outside of the housing 11, and spring means 25 provided inside the housing 11 for constantly causing the air bleeding cock 32 to be biased upward for protruding the cock outer end 32a outward from the housing 11.

[0023] In addition, the air bleeding cock 32 and the cock retention hole 31 together configure the air bleeding circuit 40 which normally blocks the communication between the coolant passage 15 inside the housing 11 and the air bleeding hole 33 by the air bleeding cock 32 being biased outward by the spring means 25, and allows the coolant passage 15 inside the housing 11 to communicate with the air bleeding hole 33 when the cock outer end 32a is subjected to pressing operation and pushed into the cock retention hole 31 against the biasing force of the spring means 25.

[0024] Here, in this embodiment, the air bleeding circuit 40 performs air bleeding by being selectively communicated with or blocked from the coolant passage 15 as a result of an annular space part 41 formed at the center in the longitudinal direction of the air bleeding cock 32 and the cock retention hole 31 communicating with the air bleeding hole 33, and the annular space part 41 being guided along the outer periphery of the air bleeding cock 32 based on the vertical movement of the air bleeding cock 32. Note that sealing means such as an 0-ring is provided, as needed, to the outer periphery of the air bleeding cock 32.

[0025] Moreover, in this embodiment, the air bleeding cock 32 is disposed coaxially with the moving direction of the thermoelement 21 of the thermostat 10, and the spring means 25 for biasing the thermoelement 21 can

thereby be used as the spring means for biasing the air bleeding cock 32.

[0026] According to the foregoing configuration, the air bleeding part 30 can be provided to the thermostat 10 with a simple configuration based on minimal components.

[0027] According to the foregoing configuration, as a result of the cock 32 being pushed into the housing 11 against the spring means 25 by pressing the outer end 32a of the air bleeding cock 32 from the outside, the gap along the outer periphery of the cock 32, the annular space 41 and the air bleeding hole 33 will be in communication, and the air bleeding circuit 40 is thereby released. Consequently, while the pressing operation is being performed, air bleeding from the coolant passage 15 or the like can be performed appropriately and reliably.

[0028] After the air bleeding is complete, the pressing operation is stopped. Then, as shown in Fig. 2, the air bleeding cock 32 will be subjected to the biasing force of the spring means 25 and its outer end 32a will protrude outward. Consequently, the air bleeding circuit 40 is blocked with the sealing part provided to the outer periphery of the cock 32.

[0029] Moreover, with the foregoing thermostat 10, when the coolant temperature rises and the thermoelement 21 detects a prescribed temperature, the piston 23 protrudes and the thermoelement 21 moves upward to cause the coolant passage 15 in the housing 11 to communicate with the exit-side cylindrical part 14 on the radiator side via the inner chamber on the cap 12 side.

[0030] As shown in Fig. 3B, note that the housing 11 is provided with a small-diameter communication passage 26 for causing its internal coolant passage 15 to communicate with the inner chamber on the cap 12 side, and configured so that a slight amount of coolant will flow when the thermostat 10 is closed. Needless to say, when the coolant temperature rises and the thermoelement 21 moves in the opening direction, a large flow of the coolant will occur.

[0031] In the foregoing embodiment, although the air bleeding circuit 40 for causing the coolant passage 15 inside the housing 11 to communicate with the air bleeding hole 33 is configured from the annular space part 41 and the like formed at the outer periphery of the air bleeding cock 32 and the inner periphery of the cock retention hole 31, the present invention is not limited thereto, and various structures may be freely adopted, according to the appended claim.

[0032] For example, the moving direction of a valve plug which freely opens and closes in the main valve provided to the fluid control device and the moving direction of the fluid discharge cock (air bleeding cock 32) can be disposed roughly coaxially so as to achieve a modified example of commoditizing the biasing means of the valve plug and the biasing means of the fluid discharge cock.

[0033] Note that the present invention is not limited to the structure explained in the foregoing embodiments, and it goes without saying that the shape, structure and the like of the respective components configuring the fluid control device such as the thermostat 10 or a cooling system of an engine using such thermostat 10 can be modified or changed as needed, according to the appended claim.

[0034] Moreover, in the foregoing embodiment, although a case of performing air bleeding in an engine cooling system using the thermostat 1 was explained, the present invention is not limited thereto and is able to yield effects by being used in various fluid discharge structures for various fluid control devices for performing air bleeding, water removal, oil removal or the like.

[0035] For example, it should be easy to understand that the foregoing effects can be yielded by applying the present invention to the water removal structure when replacing the coolant or discharging the coolant upon discarding the engine in a cooling system of an internal-combustion engine shown in Japanese Unexamined Utility Model Registration Application Publication No. S61-26588.

[0036] Moreover, it should be easy to understand that the foregoing effects can be yielded by applying the present invention to the oil removing part for removing oil in a fluid control device such as an oil cooler thermovalve shown in Japanese Unexamined Utility Model Registration Application Publication No. S60-25021.

[0037] It goes without saying that the fluid discharge cock to perform the water removal or oil removal in the foregoing fluid discharge part differs from the type that is provided to the upper part of the housing for performing air bleeding in the foregoing embodiment, and is provided downward or sideways to the lower part of the housing.

Claims

1. Fluid control device with a fluid discharge structure, comprising:

   a fluid discharge part (30) provided to a part of a housing (11) ;
   wherein the fluid discharge part (30) is composed of a cock retention hole (31) formed to open at a part of the housing (11), a fluid discharge cock (32) that is slidably retained in the cock retention hole (31) and in which a cock outer end (32a) is subjected to pressing operation from an outside of the housing (11), a fluid discharge hole (33) that opens from a part of the cock retention hole (31) in a longitudinal direction to the outside of the housing (11), and spring means (25) provided inside the housing (11) for constantly causing the fluid discharge cock (32) to be biased upward for protruding the cock outer end (32a) outward from the housing,
   wherein the fluid discharge cock (32) and the cock retention hole (31) together configure a fluid discharge circuit (40) which normally blocks

communication between a fluid passage (15) inside the housing (11) and the fluid discharge hole (33) by the fluid discharge cock (32) being biased outward by the spring means (25), and allows the fluid passage (15) inside the housing (11) to communicate with the fluid discharge hole (33) when the cock outer end (32a) is subjected to pressing operation and pushed into the cock retention hole (31) against a biasing force of the spring means (25),
the fluid control device being **characterised in that** it comprises a main valve and has a thermoelement (21) built into the housing (11), and wherein the main valve or the thermoelement (21) of the fluid control device is biased with the spring means (25) used for biasing the fluid discharge cock (32).

Patentansprüche

1. Flüssigkeitssteuervorrichtung mit einer Flüssigkeitsaustrittsstruktur, enthaltend:

einen Flüssigkeitsaustrittsteil (30), der in einem Teil eines Gehäuses (11) vorgesehen ist;
wobei der Flüssigkeitsaustrittsteil (30) aus einer Hahnzurückhalteöffnung (31), die an einem Teil des Gehäuses (11) beginnt, einem Flüssigkeitsaustrittshahn (32), der verschiebbar in der Hahnzurückhalteöffnung (31) gehalten wird und bei dem ein äußeres Hahnende (32a) einer Druckoperation von außerhalb des Gehäuses (11) ausgesetzt ist, einer Flüssigkeitsaustrittsöffnung (33), die sich von einem Teil der Hahnzurückhalteöffnung (31) in Längsrichtung zur Außenseite des Gehäuses (11) erstreckt, und einem Federmittel (25), das innerhalb des Gehäuses (11) vorgesehen ist, um ständig zu bewirken, dass der Flüssigkeitsaustrittshahn (32) nach oben vorgespannt wird, um das äußere Hahnende (32a) nach außen aus dem Gehäuse herausragen zu lassen, besteht,
wobei der Flüssigkeitsaustrittshahn (32) und die Hahnzurückhalteöffnung (31) zusammen eine Flüssigkeitsaustrittsschaltung (40) bilden, die normalerweise eine Verbindung zwischen einer Flüssigkeitspassage (15) innerhalb des Gehäuses (11) und der Flüssigkeitsaustrittsöffnung (33) durch Nachaußenvorspannen des Flüssigkeitsaustrittshahns (32) durch das Federmittel (25) blockiert, und eine Verbindung zwischen der Flüssigkeitspassage (15) innerhalb des Gehäuses (11) mit der Flüssigkeitsaustrittsöffnung (33) zulässt, wenn das äußere Hahnende (32a) einer Druckoperation ausgesetzt ist und gegen die Vorspannkraft des Federmittels (25) in die Hahnzurückhalteöffnung (31) geschoben wird,
wobei die Flüssigkeitssteuervorrichtung **dadurch gekennzeichnet ist, dass** es ein Hauptventil und ein Thermoelement (21) aufweist, die in das Gehäuse (11) eingebaut sind,
wobei das Hauptventil oder das Thermoelement (21) der Flüssigkeitssteuervorrichtung mit dem zum Vorspannen des Flüssigkeitsaustrittshahns (32) verwendeten Federmittel (25) vorgespannt wird.

Revendications

1. Dispositif de régulation de fluide présentant une structure de décharge de fluide comprenant :

une partie de décharge de fluide (30) prévue sur une partie d'un boîtier (11) ;
la partie de décharge de fluide (30) étant composée d'un trou de retenue de robinet (31) formé pour s'ouvrir au niveau d'une partie du boîtier (11), un robinet de décharge de fluide (32) qui est retenu de manière coulissante dans le trou de retenue de robinet (31) et
dans lequel une extrémité extérieure de robinet (32a) est soumise à une opération de pressage depuis l'extérieur du boîtier (11), un trou de décharge de fluide (33) qui s'ouvre à partir d'une partie du trou de retenue de robinet (31) dans une direction longitudinale vers l'extérieur du boîtier (11), et un moyen de ressort (25) prévu à l'intérieur du boîtier (11) pour provoquer constamment la sollicitation vers le haut du robinet de décharge de fluide (32) pour faire saillir l'extrémité extérieure de robinet (32a) vers l'extérieur à partir du boîtier,
le robinet de décharge de fluide (32) et le trou de retenue de robinet (31) configurant ensemble un circuit de décharge de fluide (40) qui bloque normalement la communication entre un passage de fluide (15) à l'intérieur du boîtier (11) et le trou de décharge de fluide (33) par la sollicitation du robinet de décharge de fluide (32) vers l'extérieur par le moyen de ressort (25), et permet au passage de fluide (15) à l'intérieur du boîtier (11) de communiquer avec le trou de décharge de fluide (33) lorsque l'extrémité extérieure de robinet (32a) est soumise à une opération de pressage et poussée dans le trou de retenue de robinet (31) à l'encontre d'une force de sollicitation du moyen de ressort (25),
le dispositif de régulation de fluide étant **caractérisé en ce qu'**il comprend une soupape principale et présente un thermo-élément (21) intégré dans le boîtier (11), et
la soupape principale ou le thermo-élément (21) du dispositif de régulation de fluide étant sollicité(e) avec le moyen de ressort (25) utilisé pour

solliciter le robinet de décharge de fluide (32).

FIG. 1

PRESSING OPERATION

AIR BLEEDING

ENGINE

FIG. 2

AIR BLEEDING

ENGINE

FIG. 3A

RADIATOR

FIG. 3B

RADIATOR

ENGINE

AIR BLEEDING

FIG. 1

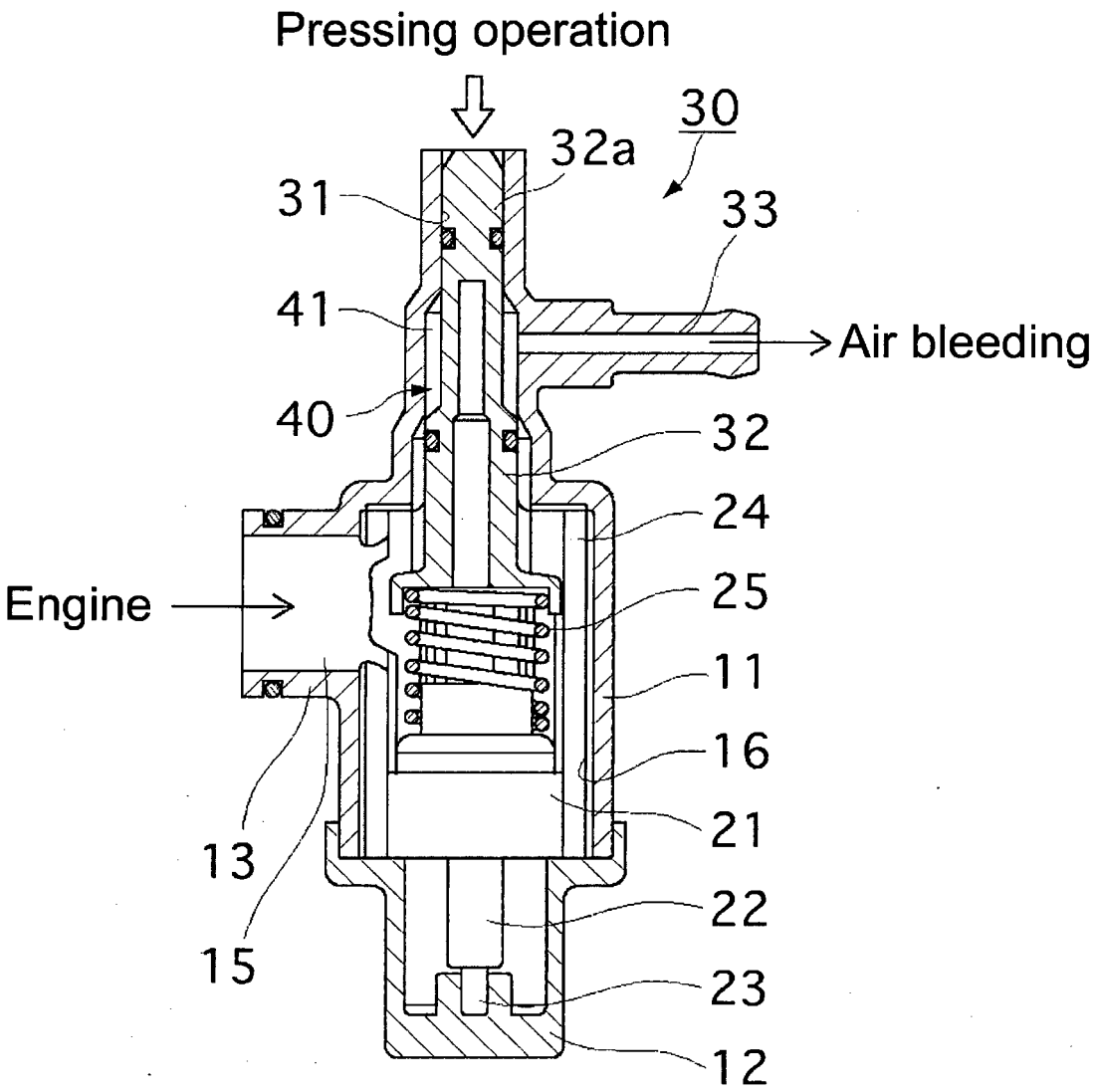

Pressing operation
30
32a
31
33
41
Air bleeding
40
32
24
Engine
25
11
16
21
13
22
15
23
12

FIG. 2

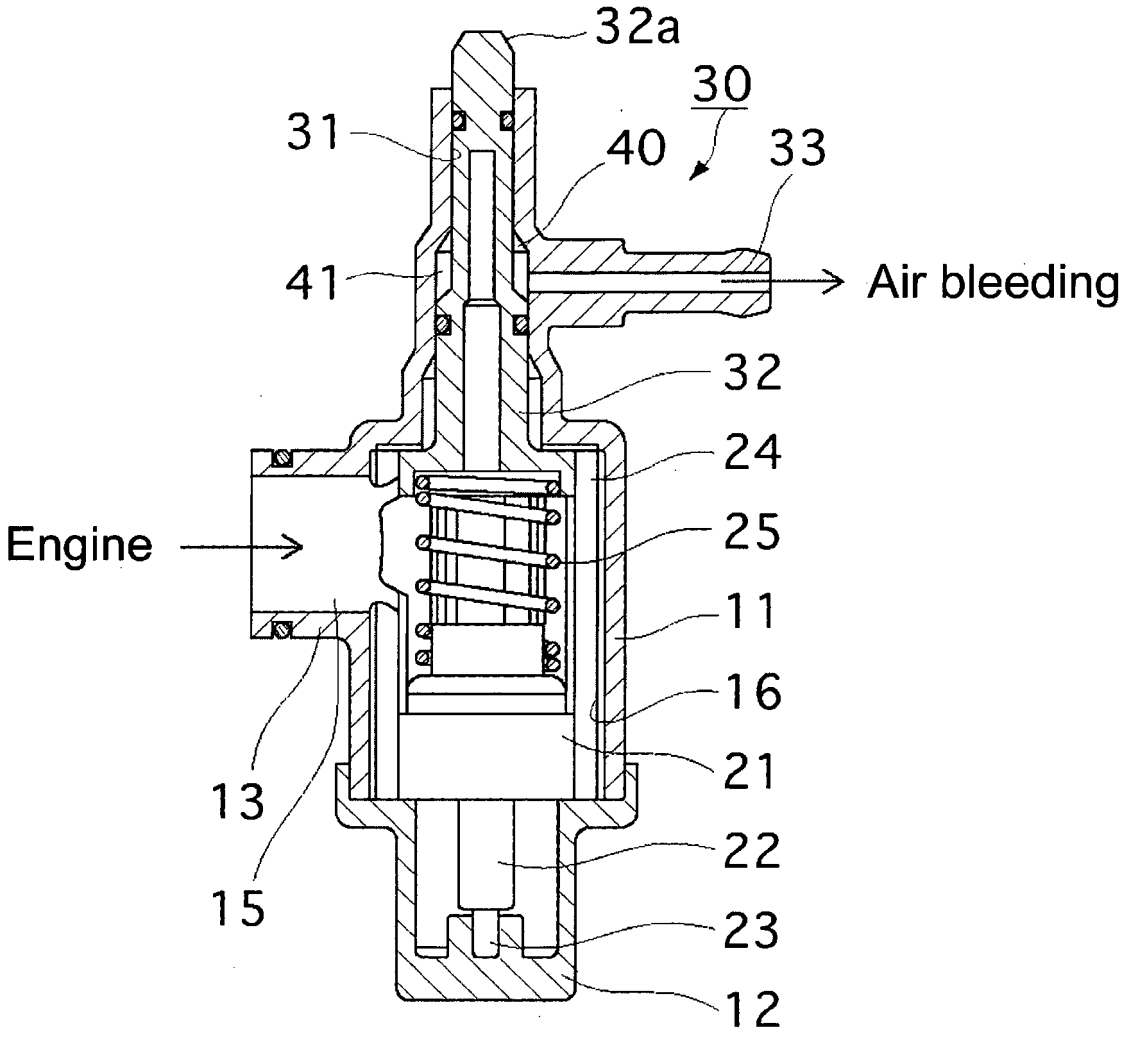

32a
30
31
40
33
41
Air bleeding
32
24
Engine
25
11
16
21
13
22
15
23
12

FIG. 3(a)

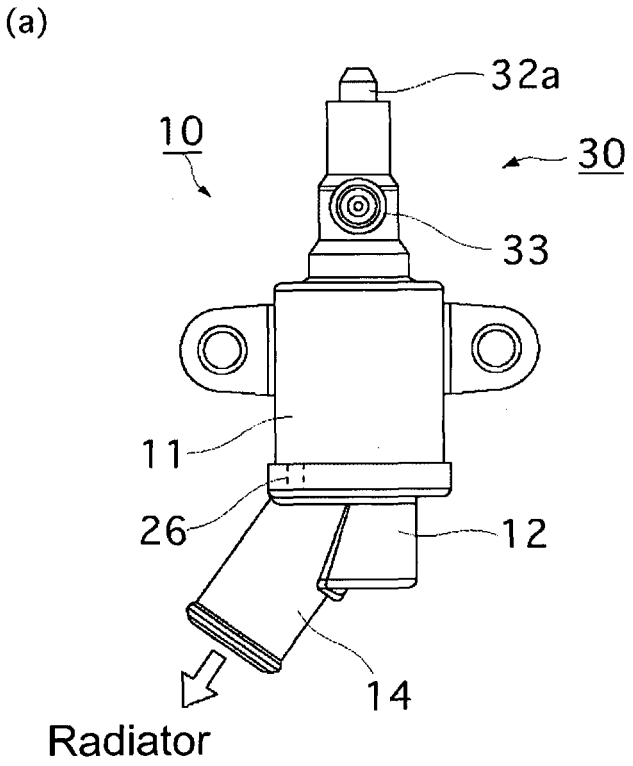
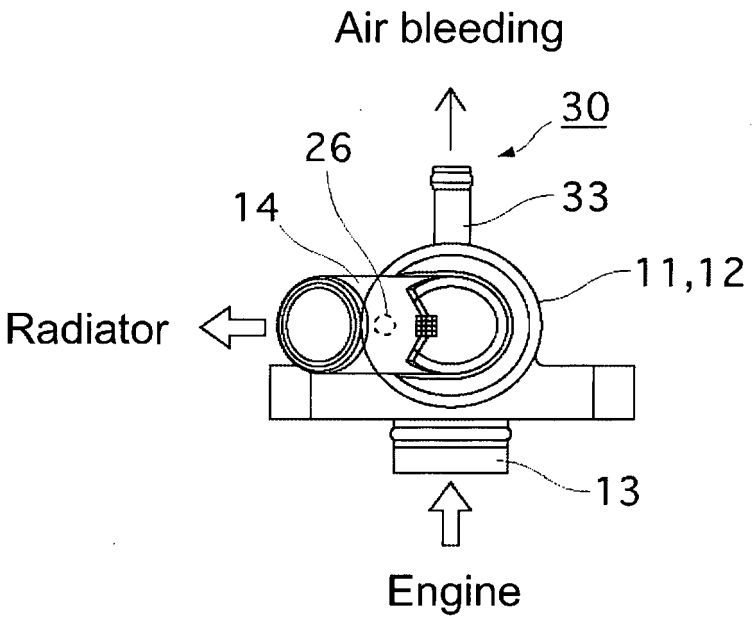


FIG. 3(b)

(b)



REFERENCES CITED IN THE DESCRIPTION

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- US 5853071 A **[0007]**
- JP S6126588 B **[0035]**
- JP S6025021 B **[0036]**