



- (51) International Patent Classification:
B60K 15/035 (2006.01) *F02M 25/08* (2006.01)
F02M 37/00 (2006.01)
- (21) International Application Number:
PCT/US2015/027740
- (22) International Filing Date:
27 April 2015 (27.04.2015)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/984,424 25 April 2014 (25.04.2014) US
- (71) Applicant: **EATON CORPORATION** [US/US]; Eaton Center, 1000 Eaton Blvd., Cleveland, Ohio 44122 (US).
- (72) Inventors: **MCLAUCHLAN, Raymond Bruce**; 48067 Jester Drive, Macomb, Michigan 48044 (US). **AM-BROSE, Steven Lee**; 33541 Stocker Street, Farmington Hills, Michigan 48335 (US). **SMITH, Jeffrey Bernard**; 3112 Salem Drive, Rochester Hills, Michigan 48306 (US). **HUSEYIN, Mustafa**; Schuetzenstrasse 40, 76137 Karlsruhe (DE).

- (74) Agents: **HOLLIS, Brian D.** et al.; Remarck Law Group PLC, P.O. Box 210958, Auburn Hills, Michigan 48321 (US).
- (81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: FUEL TANK ISOLATION VALVE HAVING BYPASS CONFIGURATION

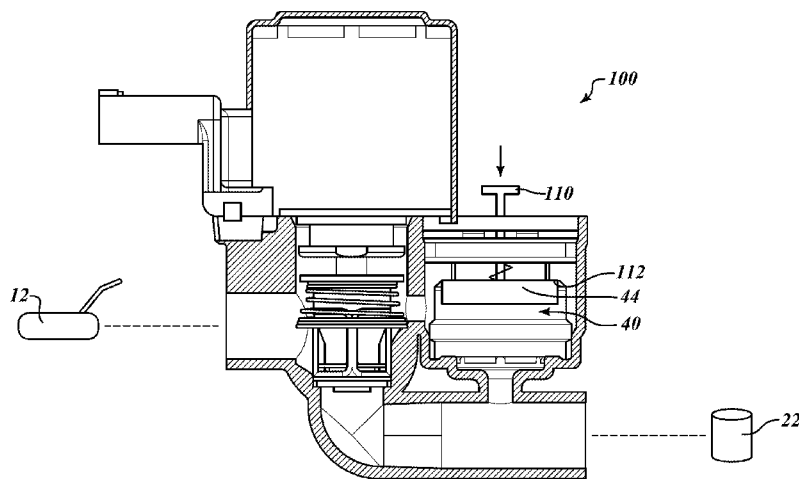


FIG.3A

(57) Abstract: A fuel tank system constructed in accordance to one example of the present disclosure includes a fuel tank, a purge canister, a valve assembly and a bypass means. The valve assembly can be fluidly coupled between the fuel tank and the purge canister and that selectively controls fuel vapor flow between the fuel tank and the purge canister. The bypass means can selectively bypass fuel vapor around at least a portion of the valve assembly from the fuel tank to the purge canister. The bypass means can include a bypass valve.



Published:

— *with international search report (Art. 21(3))*

FUEL TANK ISOLATION VALVE HAVING BYPASS CONFIGURATION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Patent Application No. 61/984,424 filed on April 25, 2014. The disclosure of the above application is incorporated herein by reference.

FIELD

[0002] The present disclosure relates generally to fuel tanks on passenger vehicles and more particularly to a fuel tank isolation valve having a bypass configuration that vents vapor from the fuel tank to a canister.

BACKGROUND

[0003] Fuel vapor emission control systems are becoming increasingly more complex, in large part in order to comply with environmental and safety regulations imposed on manufacturers of gasoline powered vehicles. Along with the ensuing overall system complexity, complexity of individual components within the system has also increased. Certain regulations affecting the gasoline-powered vehicle industry require that fuel vapor emission from a fuel tank's ventilation system be stored during periods of an engine's operation. In order for the overall vapor emission control system to continue to function for its intended purpose, periodic purging of stored hydrocarbon vapors is necessary during operation of the vehicle.

[0004] The background description provided herein is for the purpose of generally presenting the context of the disclosure. Work of the presently named inventors, to the extent it is described in this background section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art against the present disclosure.

SUMMARY

[0005] A fuel tank system constructed in accordance to one example of the present disclosure includes a fuel tank, a purge canister, a valve assembly and a bypass means.

The valve assembly can be fluidly coupled between the fuel tank and the purge canister and that selectively controls fuel vapor flow between the fuel tank and the purge canister. The bypass means can selectively bypass fuel vapor around at least a portion of the valve assembly from the fuel tank to the purge canister. The bypass means can include a bypass valve.

[0006] In other configurations, the valve assembly can comprise an over-pressure relief valve having a piston and a seal that collectively translates relative to a seat between open and closed positions. The bypass means can comprise a pushpin that is selectively movable to urge the seal of the over-pressure relief valve off of the corresponding seat. The valve assembly can be disposed in a housing. The pushpin can extend out of the housing.

[0007] According to other features, the bypass means can comprise an over-pressure relief valve having a seal formed of magnetic material. The seal can selectively engage a corresponding seat in a closed position. The seal can be selectively urged away from the corresponding seat upon a magnet being placed proximate to the seal. The seal can be normally urged toward the corresponding seat by a spring.

[0008] In other features, the valve assembly can further comprise a normally closed flow restrictor having a seal that translates relative to a seat between open and closed positions. The bypass means can comprise a pull pin that extends through the housing. Manual actuation of the pull pin can urge the seal off of the seat to the open position. The bypass means can comprise one of a button, a lever, an arm and a deformable housing. Movement of the bypass means can urge the seal off of the seat to the open position.

[0009] A fuel tank system constructed in accordance to another example of the present disclosure can include a fuel tank, a purge canister, a housing and a valve assembly. The valve assembly can be configured in the housing and be fluidly coupled between the fuel tank and the purge canister. The valve assembly selectively controls fuel vapor between the fuel tank and the purge canister. The valve assembly can include an over-pressure relief valve that includes a seal. The seal can translate between (i) an open position wherein the seal is offset from a corresponding seat and fuel vapor flows from the fuel tank to the purge canister and (ii) a closed position wherein the seal is engaged to the seat and fuel vapor is inhibited from flowing from the fuel tank to the purge

canister. A device can selectively urge the seal from the closed position to the open position.

[0010] According to additional features, the device can include a pushpin that extends from the housing and that is selectively movable from an unactuated position to an actuated position. In the actuated position, the pushpin manually urges the seal off of the corresponding seat thereby creating a fuel vapor path from the fuel tank to the purge canister. The pushpin can be biased toward the unactuated position. In one example, the seal can include magnetic material. The device can include a magnet. Placement of the magnet proximate to the seal can urge the seal to translate away from the seat thereby creating a fuel vapor path from the fuel tank to the purge canister.

[0011] A fuel tank system constructed in accordance to another example of the present disclosure can include a fuel tank, a purge canister, a housing, a valve assembly and a flow restrictor. The valve assembly can be configured in the housing and be fluidly coupled between the fuel tank and the purge canister. The valve assembly can selectively control fuel vapor between the fuel tank and the purge canister. The flow restrictor can be arranged in the housing and have a first seal that selectively translates between (i) an open position wherein the first seal is offset from a first seat and fuel vapor flows from the fuel tank to the purge canister and (ii) a closed position wherein the first seal is engaged to the first seat and fuel vapor is inhibited from flowing from the fuel tank to the purge canister. A device can selectively urge the first seal from the closed position to the open position.

[0012] According to other features, the device can include a pull pin that extends from the housing. Manual actuation of the pull pin can urge the first seal off of the first seat to the open position. In other examples, the device can comprise one of a button, a lever, an arm and a deformable housing. Movement of the device urges the first seal off of the first seat to the open position. The valve assembly can further include a valve assembly having an over-pressure relief valve. The over-pressure relief valve can include a second seal that translates between (i) an open position wherein the second seal is offset from a corresponding second seat and fuel vapor flows from the fuel tank to the purge canister and (ii) a closed position wherein the second seal is engaged to the second seat and fuel vapor is inhibited from flowing from the fuel tank to the purge canister.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present disclosure will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0014] FIG. 1 is a schematic illustration of a fuel tank system having an evaporative emissions control system including a valve assembly constructed in accordance to one example of the present disclosure;

[0015] FIG. 2 is a schematic illustration of a fuel tank configuration having a normally closed bypass valve according to one example of the present disclosure;

[0016] FIG. 3A is schematic illustration of a fuel tank configuration having a manually operable push pin according to one example of the present disclosure and shown in an unactuated position;

[0017] FIG. 3B is a schematic illustration of the fuel tank configuration of FIG. 3A and shown with the push pin in an actuated position;

[0018] FIG. 4A is a schematic illustration of a fuel tank configuration having an over-pressure relief valve including a seal formed of magnetic material and shown in a closed position;

[0019] FIG. 4B is a schematic illustration of the fuel tank configuration of FIG. 4A and shown with the seal in an open position;

[0020] FIG. 5A is a schematic illustration of a fuel tank configuration having a manually operable pull pin according to one example of the present disclosure and shown with the pull pin in an unactuated position;

[0021] FIG. 5B is a schematic illustration of the fuel tank configuration of FIG. 5A and shown with the pull pin in an actuated position;

[0022] FIG. 6A is a schematic illustration of a fuel tank configuration having a means configured to urge a flow restrictor seal off its seat and shown with the means in an unactuated position

[0023] FIG. 6B is a schematic illustration of the fuel tank configuration of FIG. 6A and shown with the means in an actuated position; and

[0024] FIG. 7 is a schematic illustration of a fuel tank configuration having a connector that selectively connects the fuel tank and the purge canister to bypass the valve assembly according to one example of the present disclosure.

DETAILED DESCRIPTION

[0025] With initial reference to FIG. 1, a fuel tank system constructed in accordance to one example of the present disclosure is shown and generally identified at reference number 10. The fuel tank system 10 can generally include a fuel tank 12 configured as a reservoir for holding fuel to be supplied to an internal combustion engine via a fuel delivery system, which includes a fuel pump (not specifically shown). A controller 14 can be configured to regulate the operation of the engine and its fuel delivery system. The fuel tank 12 is operatively connected to an evaporative emissions control system 20 that includes a purge canister 22 adapted to collect fuel vapor emitted by the fuel tank 12 and to subsequently release the fuel vapor to the engine. The controller 14 can also be configured to regulate the operation of evaporative emissions control system 20 in order to recapture and recycle the emitted fuel vapor.

[0026] The evaporative emissions control system 20 includes a valve assembly 30. Additional description of the valve assembly 30 may be found in commonly owned U.S. Patent No. 8,944,100, the contents of which are expressly incorporated herein by reference. In general, the valve assembly 30 may control fuel vapor flow between the fuel tank 12 and the purge canister 22. While the valve assembly 30 is shown located between the fuel tank 12 and the purge canister 22, the valve assembly 30 may be configured elsewhere such as between the purge canister 22 and the engine. The controller 14 can be adapted to regulate the operation of a valve assembly 30 to selectively open and close the valve, in order to provide over-pressure and vacuum relief for the fuel tank 12. The valve assembly 30 can be configured to control a flow of fuel vapor between the fuel tank 12 and the purge canister 22. The valve assembly 30 includes a housing 32, which retains all internal components of the valve assembly 30. The housing 32 can connect to the fuel tank 12 via a first connector (not specifically shown) and to the purge canister 22 via a second connector (not specifically shown).

[0027] The housing 32 accommodates an over-pressure relief (OPR) valve 40. The OPR valve 40 includes a piston 42, which may be formed from a suitable chemically resistant material such as an appropriate plastic or aluminum. The OPR valve 40 can

also include a compliant seal 44, which may be formed from a suitable chemically resistant elastomeric material.

[0028] The piston 42 and the seal 44 may be combined into a unitary piston assembly via an appropriate manufacturing process such as overmolding. The piston 42 and the seal 44 are urged to close a passage 48 by a spring 50. The OPR valve 40 is configured to facilitate opening a first fuel vapor flow path being traversed by the fuel vapor flowing in a direction from the fuel tank 12 toward the purge canister 18 when the fuel tank 12 is above a first predetermined pressure value. The first predetermined pressure value is preferably a positive number, representing an extreme or over-pressure condition of the fuel tank 12.

[0029] The valve assembly 30 can include a solenoid assembly 60 arranged inside the housing 32. The solenoid assembly 60 is adapted to receive electrical power from a vehicle alternator or from an energy-storage device (not shown), and be triggered or energized by a control signal from the controller 14. The solenoid assembly 60 can include an armature 62, a solenoid spring 64 and a coil 66. The solenoid spring 64 can be configured to generate a force sufficient to urge armature 62 out of the solenoid assembly 60, when the solenoid assembly 60 is not energized. The coil 66 can be configured to energize solenoid assembly 60, and to withdraw the armature 62 into the solenoid assembly 60 by overcoming the biasing force of the solenoid spring 64 and exposing an orifice to allow vapor to flow therethrough.

[0030] The valve assembly 30 can additionally include a flow restrictor 70. The flow restrictor 70 can be arranged inside the housing 32. The flow restrictor 70 includes a piston 72 which may be formed from a suitable chemically resistant material such as an appropriate plastic or aluminum. The flow restrictor 70 also includes a compliant seal 74, which may be formed from a suitable chemically resistant rubber. The flow restrictor 70 is configured to be normally closed.

[0031] With reference now to FIG. 2, a fuel tank configuration constructed in accordance to one example of the present disclosure is shown and identified at reference 80. The fuel tank configuration 80 includes the fuel tank 12, the purge canister 22 and the valve assembly 30. A normally closed bypass valve 82 is incorporated along a bypass fluid line 83. The bypass fluid line 83 is fluidly connected between a first vapor line 84

connected between the fuel tank 12 and the valve assembly 30 and a second vapor line 86 connected between the valve assembly 30 and the purge canister 22. The fuel tank configuration 80 can contain the fuel vapor between the fuel tank 12 and the purge canister 22. The bypass valve 82 can be opened to fluidly connect the fuel tank 12 to the purge canister 22 which bypassing the valve assembly 30. The fuel tank configuration can be particularly useful while adding fuel to the fuel tank 12 while the valve assembly 30 is prevented from venting to the purge canister 22 (such as when the valve assembly 30 has yet to be connected to power).

[0032] Turning now to FIGS. 3A and 3B, a fuel tank configuration constructed in accordance to another example of the present disclosure is shown and identified at reference 100. Unless described otherwise, the fuel tank configuration 100 can comprise the same features as described above with respect to the fuel tank system 10. The fuel tank configuration 100 includes a manually operable pushpin 110 that can be manually actuated to open the OPR valve 40. Specifically, the pushpin 110 can be translated from an unactuated position (FIG. 3A) to an actuated position (FIG. 3B). In the actuated position, the pushpin is moved in a direction to move the seal 44 off a corresponding seat 112 at the passage 48 from a closed position to an open position. When the seal 44 is moved off its seat 112 from actuation of the pushpin 110, the tank 12 is vented to the purge canister 22. In one example, the pushpin 110 is biased toward the closed position. Other configurations are contemplated that can cause the seal 44 to move off the seat 112.

[0033] With reference to FIGS. 4A and 4B, a fuel tank configuration constructed in accordance to another example of the present disclosure is shown and identified at reference 120. Unless described otherwise, the fuel tank configuration 120 can comprise the same features as identified above with respect to the fuel tank system 10. The fuel tank configuration 120 includes an OPR valve 140 having a seal 144 that is formed of magnetic material. A spring 146 can bias the seal 144 against its seat. The seal 144 can be urged from a closed position (FIG. 4A) away from its corresponding seat 147 to an open position (FIG. 4B) and against the bias of the spring 146 by an external magnet 148. In this regard, the magnet 148 can be used to pull the seal 144 off of its seat. When the seal 144 is moved off its seat 147 from the magnet 148, the tank 12 is vented to the purge

canister 22. Other configurations are contemplated that can cause the seal 144 to move off the seat 147.

[0034] Turning now to FIGS. 5A and 5B, a fuel tank configuration constructed in accordance to another example of the present disclosure is shown and identified at reference 150. Unless described otherwise, the fuel tank configuration 150 can comprise the same features as identified above with respect to the fuel tank system 10. The fuel tank configuration 150 includes a pull pin 160 that extends through a canister 164 that houses the solenoid assembly 60. The pull pin 160 can be coupled to the armature 62 allowing the armature 62 and compliant seal 74 to be pulled up and off a seat 166. In this regard, actuation of the pull pin 160 can urge the compliant seal 74 from a closed position (FIG. 5A) to an open position (FIG. 5B). Other configurations are contemplated that can cause the compliant seal 74 to move from the closed position to the open position.

[0035] With reference now to FIGS. 6A and 6B, a fuel tank configuration constructed in accordance to another example of the present disclosure is shown and identified at reference 180. Unless described otherwise, the fuel tank configuration 180 can comprise the same features as identified above with respect to the fuel tank system 10. The fuel tank configuration 180 includes a means 182 that is configured to urge the compliant seal 74 up and off of its seat 166. The means 182 can move between an unactuated position (FIG. 6A) and an actuated position (FIG. 6B). The means 182 can comprise a button, a lever an arm or other structure that connects to the compliant seal 74 to urge the compliant seal 74 off of its seat. In other examples, the means 182 can include a deformable housing portion that can be deflected to gain access to the compliant seal 74.

[0036] With reference to FIG. 7, a fuel tank configuration constructed in accordance to another example of the present disclosure is shown and identified at reference 190. Unless described otherwise, the fuel tank configuration 190 can comprise the same features as identified above with respect to the fuel tank system 10. The fuel tank configuration 190 includes the fuel tank 12, the purge canister 22 and the valve assembly 30. A connector 194 can be selectively coupled between the first vapor line 84 and the second vapor line 86. The connector 194 can comprise any tool, device or mechanism that fluidly connects the fuel tank 12 with the purge canister 22 while bypassing the valve assembly 30.

[0037] The foregoing description of the examples has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular example are generally not limited to that particular example, but, where applicable, are interchangeable and can be used in a selected example, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

CLAIMS

What is claimed is:

1. A fuel tank system comprising:
a fuel tank;
a purge canister;
a valve assembly that is fluidly coupled between the fuel tank and the purge canister and that selectively controls fuel vapor flow between the fuel tank and the purge canister; and
a bypass means that selectively bypasses fuel vapor around at least a portion of the valve assembly from the fuel tank to the purge canister.
2. The fuel tank system of claim 1 wherein the bypass means comprises a bypass valve.
3. The fuel tank system of claim 1 wherein the valve assembly comprises an over-pressure relief valve having a piston and a seal that collectively translate relative to a seat between open and closed positions.
4. The fuel tank system of claim 3 wherein the bypass means comprises a pushpin that is selectively movable to urge the seal of the over-pressure relief valve off of the corresponding seat.
5. The fuel tank system of claim 4 wherein the valve assembly is disposed in a housing and wherein the pushpin extends out of the housing.
6. The fuel tank system of claim 1 wherein the bypass means comprises an over-pressure relief valve having a seal formed of magnetic material, the seal selectively engaging a corresponding seat in a closed position.

7. The fuel tank system of claim 6 wherein the seal is selectively urged away from the corresponding seat upon a magnet being placed proximate to the seal.

8. The fuel tank system of claim 7 wherein the seal is normally urged toward the corresponding seat by a spring.

9. The fuel tank system of claim 1 wherein the valve assembly comprises a normally closed flow restrictor having a seal that translates relative to a seat between open and closed positions.

10. The fuel tank system of claim 9 wherein the bypass means comprise a pull pin that extends through the housing, wherein manual actuation of the pull pin urges the seal off of the seat to the open position.

11. The fuel tank system of claim 9, wherein the bypass means comprises one of a button, lever, arm and deformable housing, wherein movement of the bypass means urges the seal off of the seat to the open position.

12. A fuel tank system comprising:
 - a fuel tank;
 - a purge canister;
 - a housing;
 - a valve assembly configured in the housing and that is fluidly coupled between the fuel tank and the purge canister and that selectively controls fuel vapor flow between the fuel tank and the purge canister, the valve assembly having an over-pressure relief valve disposed therein, the over-pressure relief valve including a seal that translates between (i) an open position wherein the seal is offset from a corresponding seat and fuel vapor flows from the fuel tank to the purge canister and (ii) a closed position wherein the seal is engaged to the seat and fuel vapor is inhibited from flowing from the fuel tank to the purge canister; and
 - a device that manually and selectively urges the seal from the closed position to the open position.
13. The fuel tank system of claim 12 wherein the device comprises:
 - a pushpin extending from the housing that is selectively movable from an unactuated position to an actuated position, in the actuated position the pushpin manually urges the seal off of the corresponding seat thereby creating fuel vapor path from the fuel tank to the purge canister.
14. The fuel tank system of claim 13 wherein the pushpin is biased toward the unactuated position.
15. The fuel tank system of claim 12 wherein the seal includes magnetic material.
16. The fuel tank system of claim 15 wherein the device comprises a magnet, wherein placement of the magnet proximate to the seal urges the seal to translate away from the seat thereby creating a fuel vapor path from the fuel tank to the purge canister.

17. A fuel tank system comprising:
a fuel tank;
a purge canister;
a housing;
a valve assembly configured in the housing and that is fluidly coupled between the fuel tank and the purge canister and that selectively controls fuel vapor between the fuel tank and the purge canister;
a flow restrictor arranged in the housing and having a first seal that selectively translates between (i) an open position wherein the first seal is offset from a first seat and fuel vapor flows from the fuel tank to the purge canister and (ii) a closed position wherein the first seal is engaged to the first seat and fuel vapor is inhibited from flowing from the fuel tank to the purge canister; and
a device that manually and selectively urges the first seal from the closed position to the open position.
18. The fuel tank system of claim 17 wherein the device comprises a pull pin that extends from the housing, wherein manual actuation of the pull pin urges the first seal off of the first seat to the open position.
19. The fuel tank system of claim 17 wherein the device comprises one of a button, a lever, an arm and a deformable housing, wherein movement of the device urges the first seal off of the first seat to the open position.
20. The fuel tank system of claim 17 wherein the valve assembly further comprises an over-pressure relief valve disposed therein, the over-pressure relief valve including a second seal that translates between (i) an open position wherein the second seal is offset from a corresponding second seat and fuel vapor flows from the fuel tank to the purge canister and (ii) a closed position wherein the second seal is engaged to the second seat and fuel vapor is inhibited from flowing from the fuel tank to the purge canister.

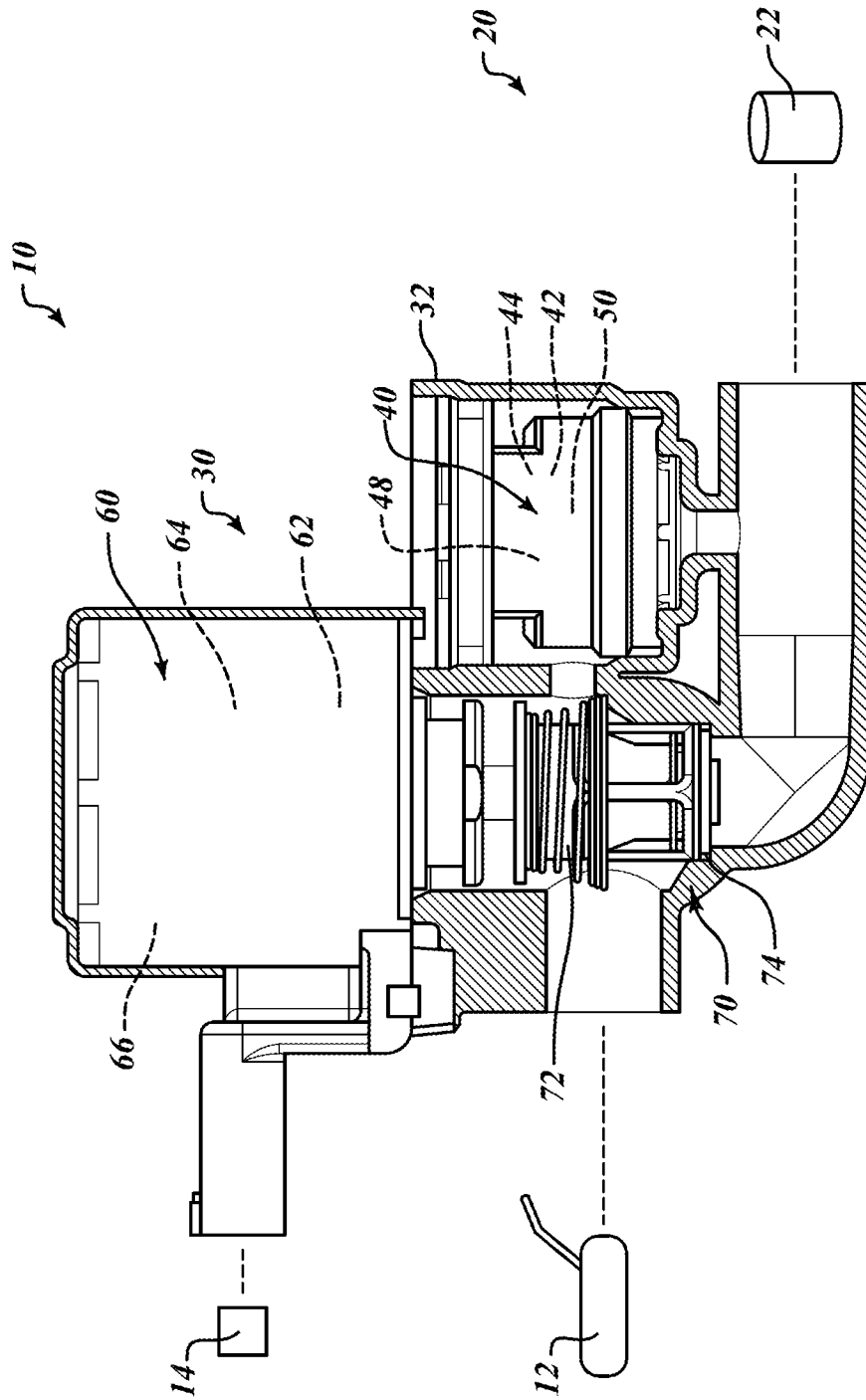


FIG. 1

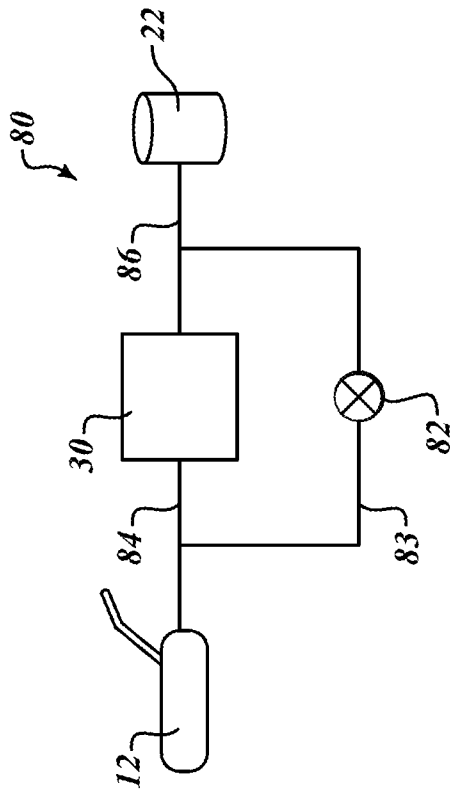


FIG. 2

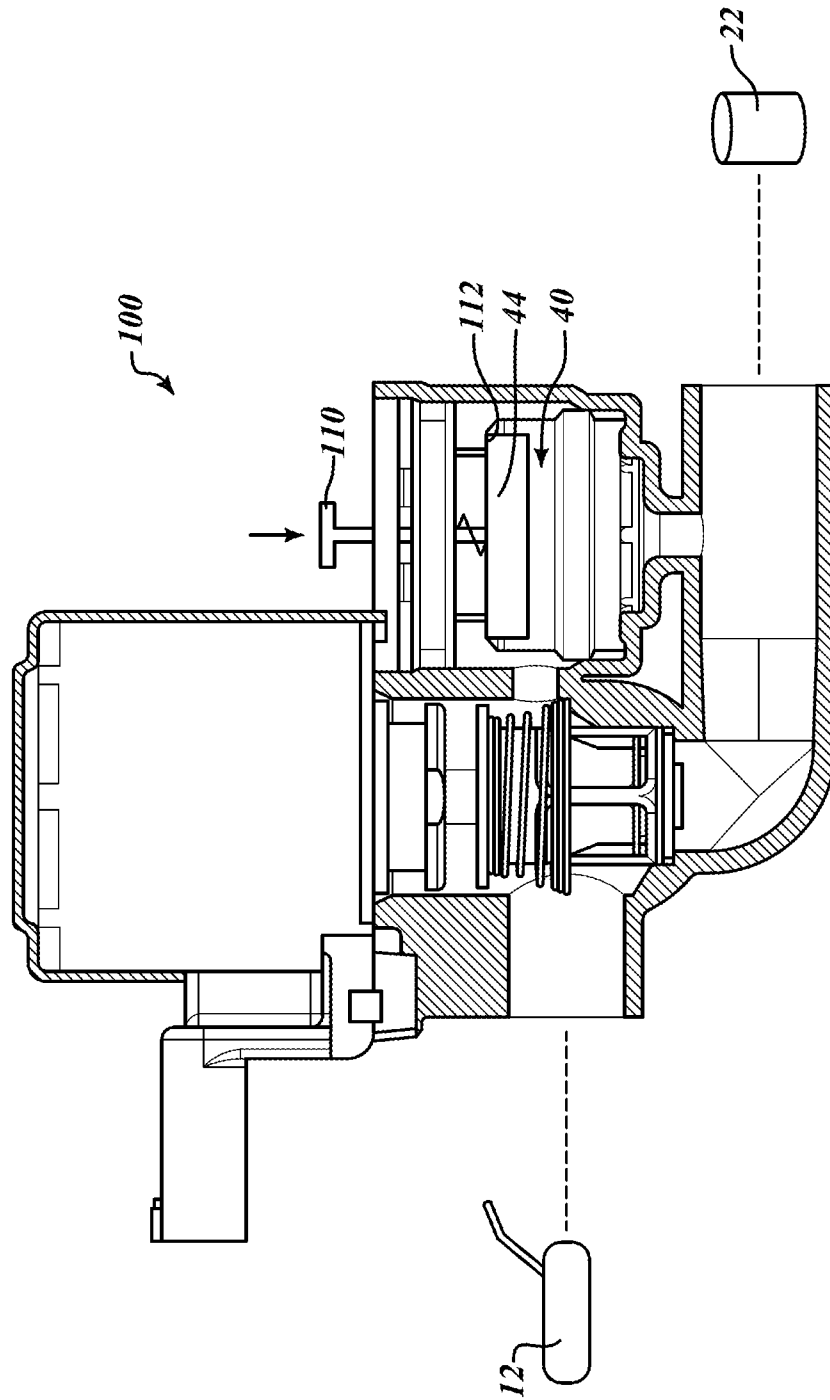


FIG.3A

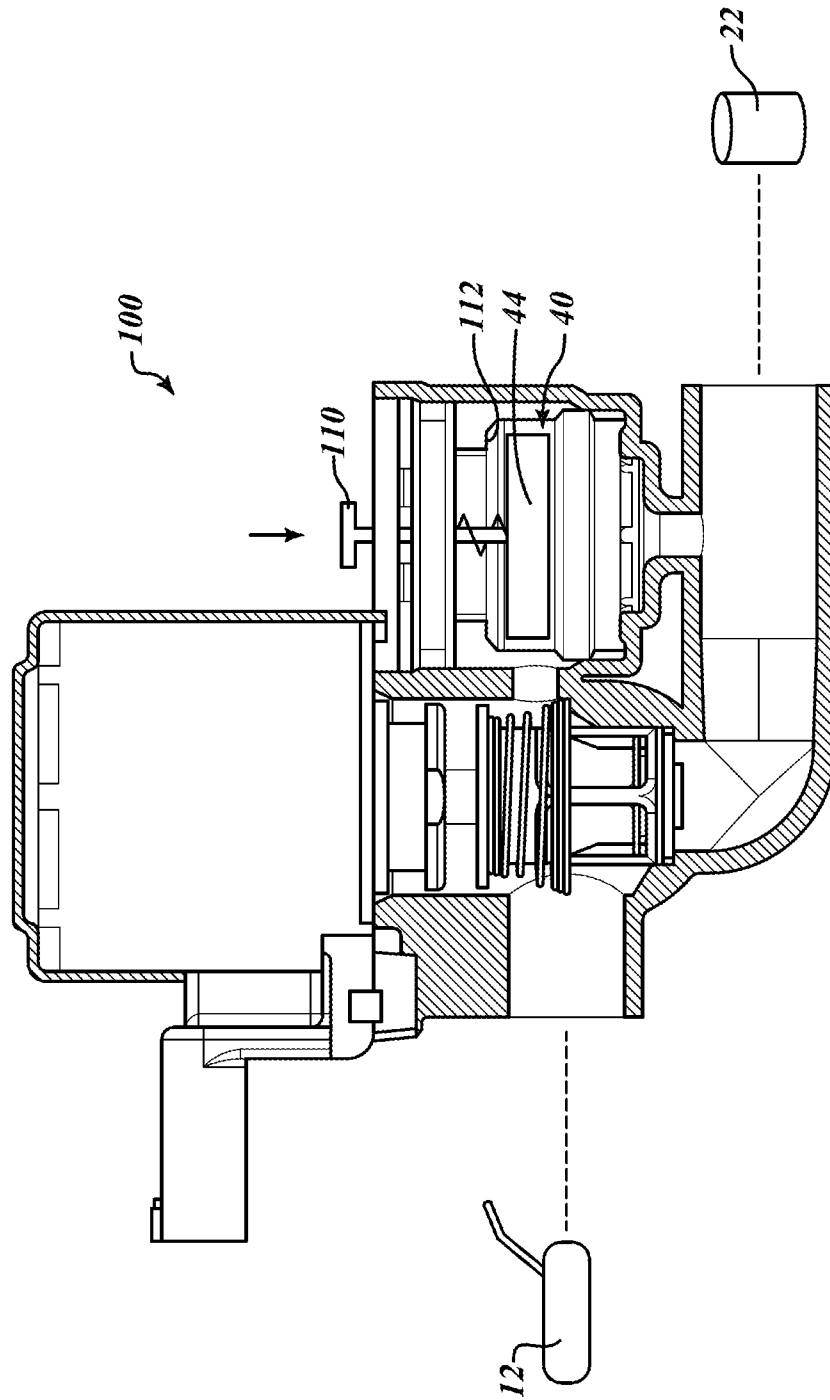


FIG.3B

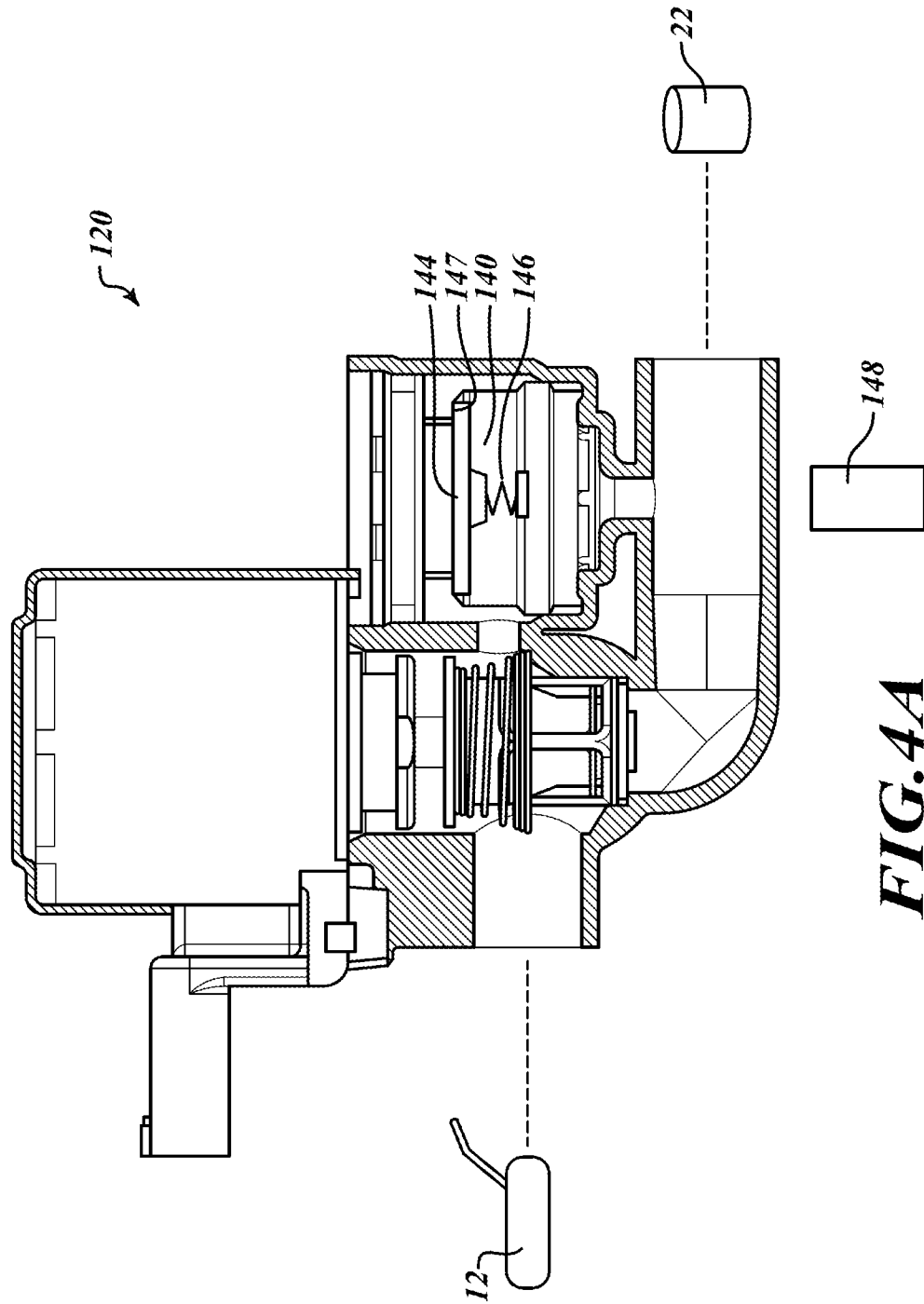


FIG. 4A

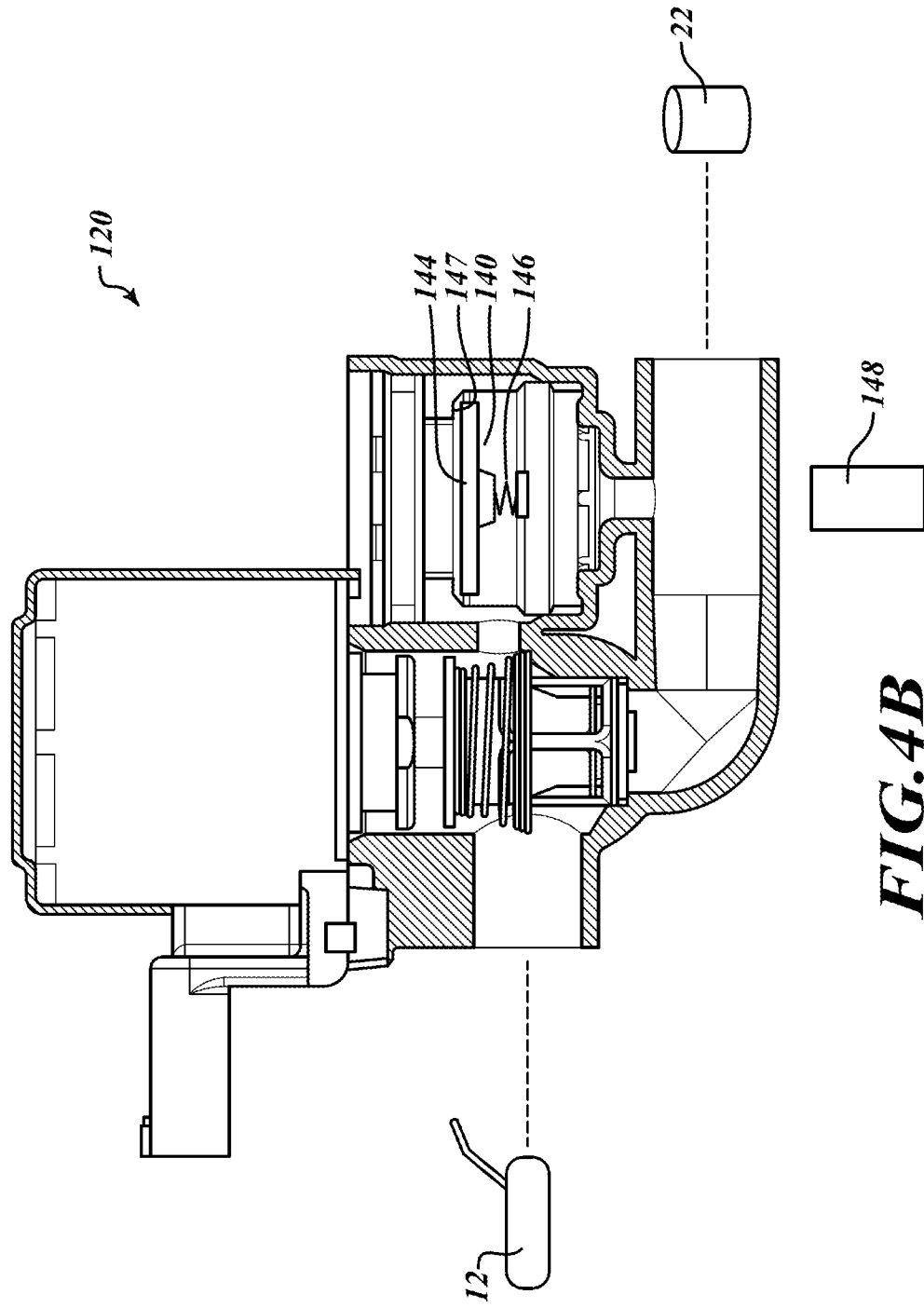


FIG. 4B

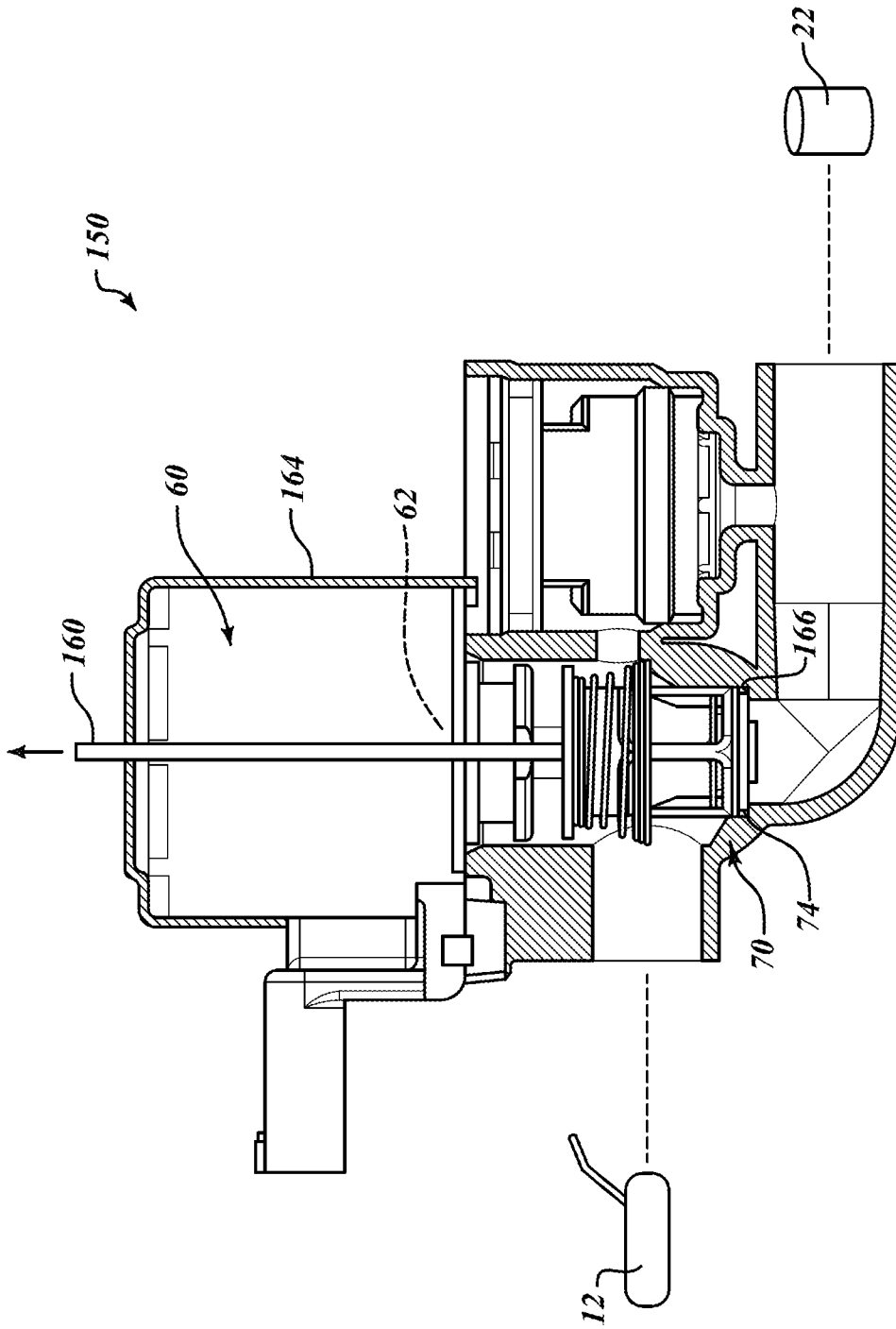


FIG. 5A

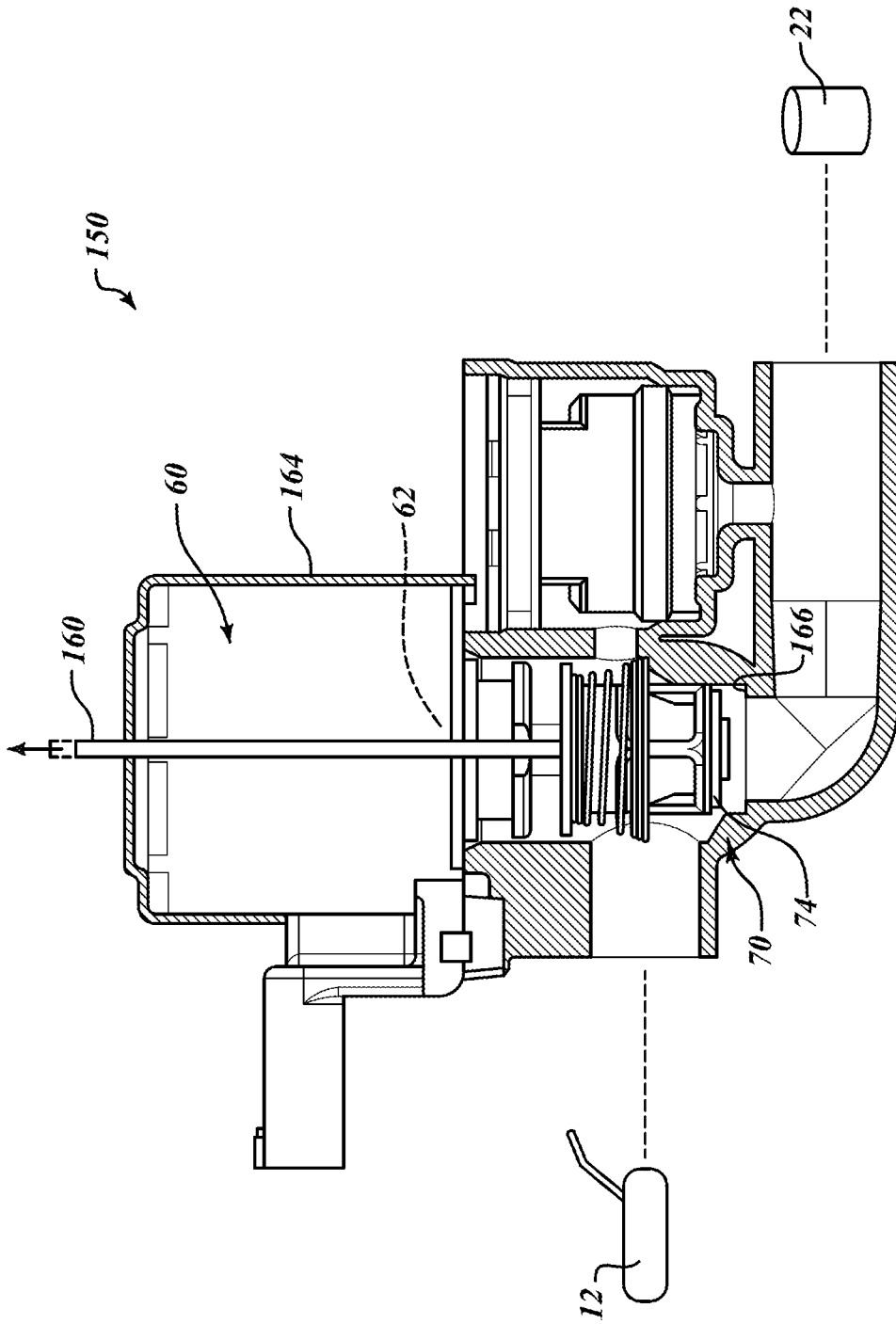


FIG. 5B

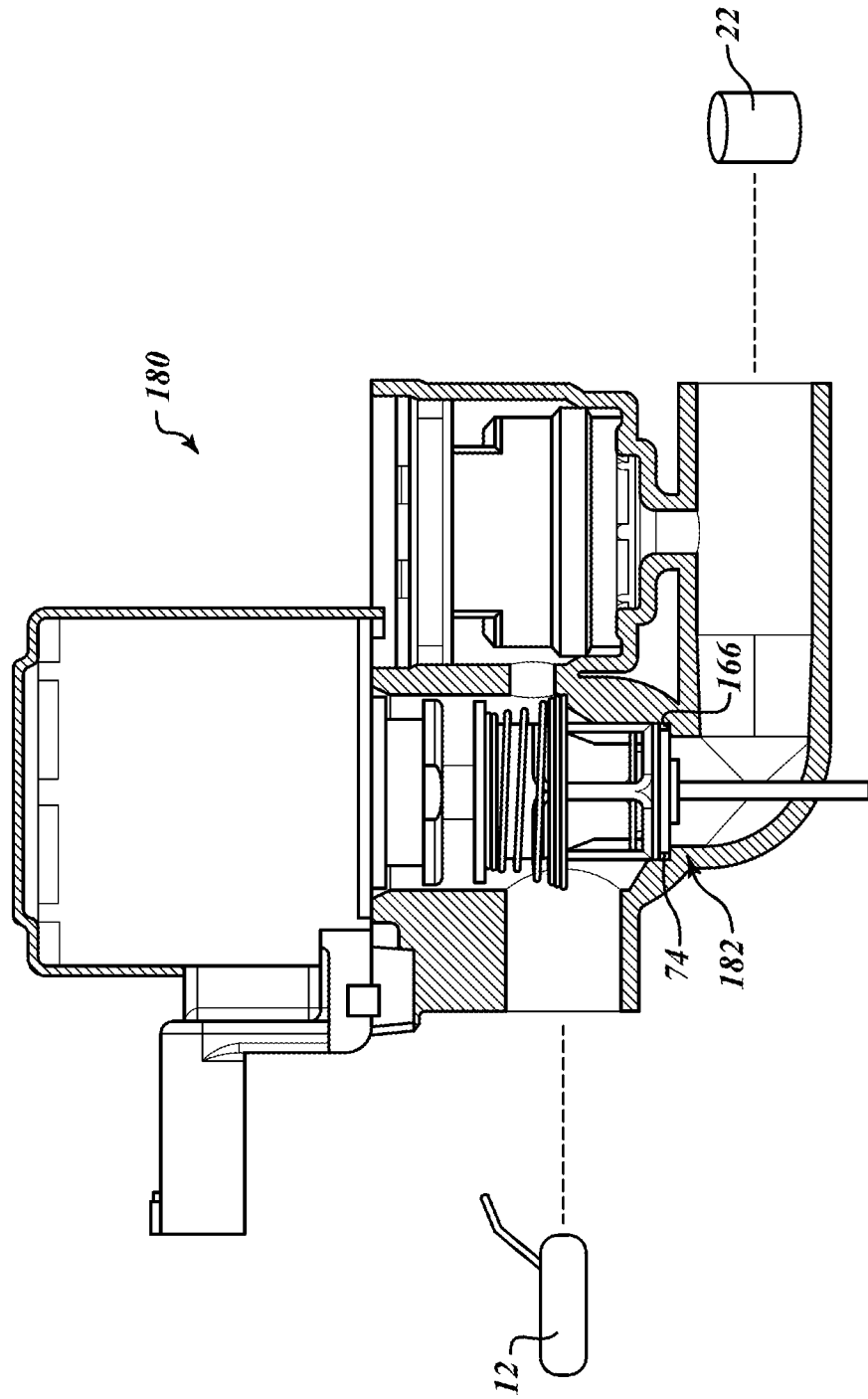


FIG. 6A

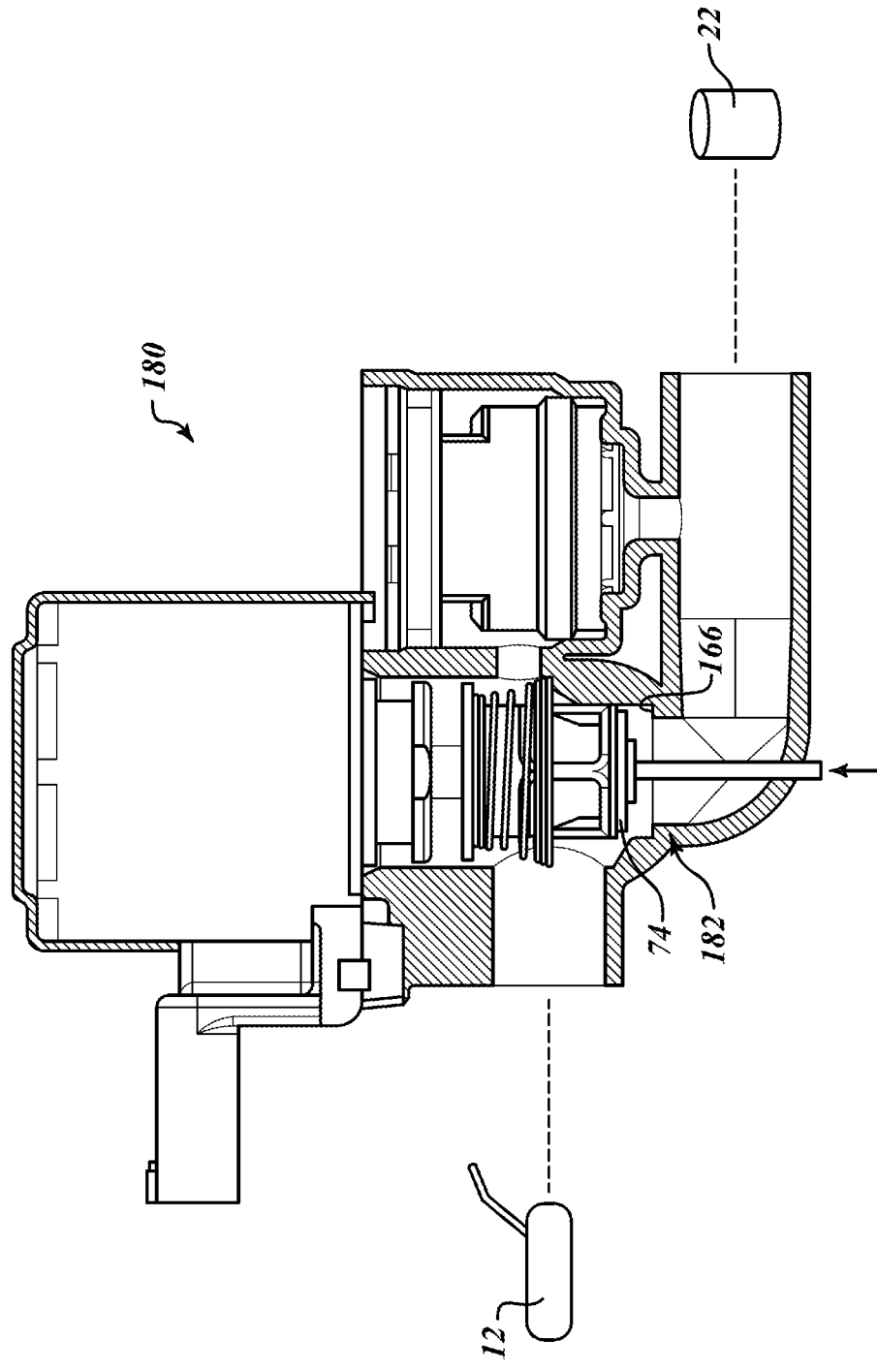


FIG. 6B

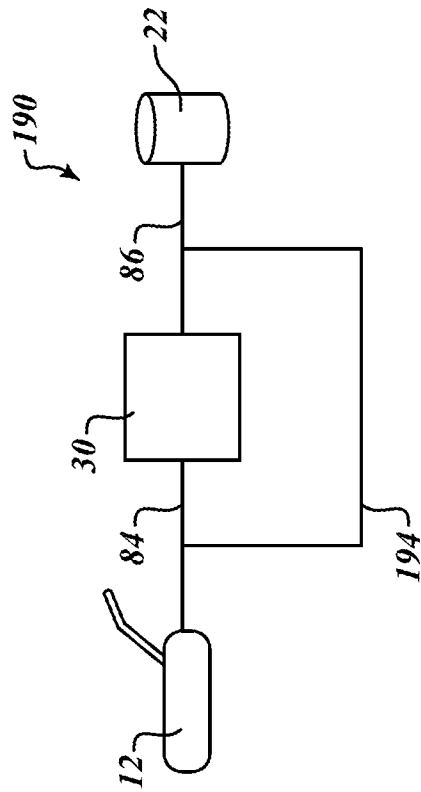


FIG. 7

A. CLASSIFICATION OF SUBJECT MATTER**B60K 15/035(2006.01)i, F02M 37/00(2006.01)i, F02M 25/08(2006.01)i**

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)

B60K 15/035; F16K 31/02; B60K 15/01; F02M 33/02; F02M 1/00; F16K 31/44; F02M 37/00; F02M 25/08

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & keywords: fuel tank system, canister, fuel vapor, valve assembly, bypass means, bypass valve, push pin, magnet, pull pin, manual actuation, and seal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2013-173406 A (TOYOTA MOTOR CORP.) 05 September 2013 See paragraphs [0028], [0033]-[0034], [0042]-[0043], [0046]-[0048], [0081], [0086] and figures 1-2, 8-9.	1-5, 9-14, 17-20
Y		6-8, 15-16
Y	US 2003-0197143 A1 (KAI et al.) 23 October 2003 See paragraphs [0038], [0041]-[0043] and figures 1-2.	6-8, 15-16
A	US 2012-0211687 A1 (BENJEY et al.) 23 August 2012 See paragraphs [0009]-[0021] and figures 1-3.	1-20
A	US 2001-0010219 A1 (ISOBE et al.) 02 August 2001 See paragraph [0021] and figures 1-2.	1-20
A	US 2011-0162728 A1 (PIFER et al.) 07 July 2011 See paragraphs [0013]-[0028] and figures 1-6.	1-20

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

21 July 2015 (21.07.2015)

Date of mailing of the international search report

22 July 2015 (22.07.2015)

Name and mailing address of the ISA/KR

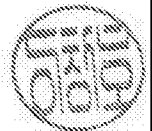
International Application Division
Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan City, 302-701,
Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

LEE, Chang Ho

Telephone No. +82-42-481-8398



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2015/027740

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2013-173406 A	05/09/2013	None	
US 2003-0197143 A1	23/10/2003	DE 10316067 A1 JP 2003-314729 A JP 2003-314730 A	13/11/2003 06/11/2003 06/11/2003
US 2012-0211687 A1	23/08/2012	CN 103370525 A EP 2676027 A1 JP 2014-512493 A KR 10-2014-0018247 A WO 2012-110889 A1	23/10/2013 25/12/2013 22/05/2014 12/02/2014 23/08/2012
US 2001-0010219 A1	02/08/2001	JP 03706785 B2 JP 2001-214817 A US 6470862 B2	19/10/2005 10/08/2001 29/10/2002
US 2011-0162728 A1	07/07/2011	CN 103402806 A EP 2422121 A1 EP 2422121 B1 EP 2665614 A1 EP 2665614 B1 JP 2012-524878 A KR 10-2012-0014164 A KR 10-2014-0007376 A US 2010-0269921 A1 US 2014-041737 A1 US 8573255 B2 US 8584704 B2 US 8944101 B2 WO 2010-122414 A1 WO 2012-100058 A1	20/11/2013 29/02/2012 16/01/2013 27/11/2013 18/03/2015 18/10/2012 16/02/2012 17/01/2014 28/10/2010 13/02/2014 05/11/2013 19/11/2013 03/02/2015 28/10/2010 26/07/2012