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(72) Inventor: **OHSIMA, Yasuo,**
MITANI VALVE CO., LTD.
Tokyo 1010025 (JP)

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(74) Representative: **Klingseisen, Franz et al**
Klingseisen & Partner
Postfach 10 15 61
80089 München (DE)

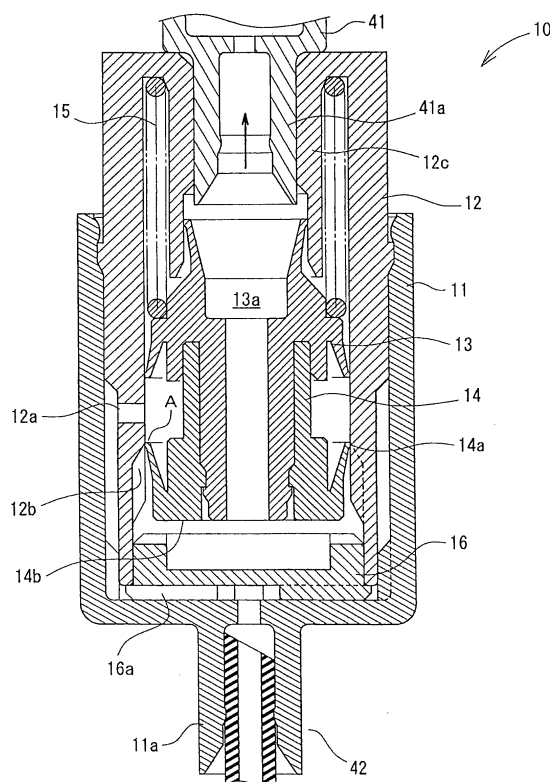
(71) Applicant: **Mitani Valve Co., Ltd.**
Tokyo 101-0025 (JP)

(54) **FLOW RATE REGULATOR UNIT FOR AEROSOL CONTAINER, FLOW RATE REGULATOR MECHANISM FOR AEROSOL CONTAINER, AND AEROSOL-TYPE PRODUCT**

(57) There is provided a novel flow rate regulator mechanism of the type where an external flow rate regulator unit for regulating a change in gas pressure in an aerosol container is mounted between a housing and a suction pipe.

The flow regulator unit 10 is mounted between the housing 41 and the suction pipe 42. A time ratio of an inlet part A, that serves as a part of passage of a content in the container, being opened is smaller as pressure of compressed gas is higher like the compressed gas at an initial stage of its use. In a stationary mode where pressure of the passage of a content is uniform, a flow rate adjusting valve 14 moves upward against a spring 15 with the aid of the uniform pressure to substantially close the inlet part A. In an actuation mode, a content in a downstream side space region of the inlet part A is first discharged to lower pressure there, so that the flow rate adjusting valve 14 moves down by the action of the spring 15 to open the inlet part A. Immediately after, the content flows into the downstream side space region to raise the pressure, the flow rate adjusting valve 14 moves upward to again substantially close the inlet part A..

FIGURE 1



Description

TECHNICAL FIELD

[0001] The present invention relates to a flow rate regulator unit or the like for aerosol containers from each of which a content therein is sprayed to an external space with the aid of the action of discharge gas (compressed gas, liquefied gas).

[0002] Particularly, the present invention concerns a flow rate regulator unit mounted for use between a housing for a stem equipped with a content passing hole part, opened and closed in response to the operation of a user, and with a passageway part extending to a downstream side of the hole part and a suction pipe for the content in the container, for stabilizing a flow rate of the content sprayed from the aerosol container to the external space by making use of the action of discharge gas in the container.

[0003] The present invention also concerns a flow rate regulator mechanism for communicating a moving air compression region of a flow rate stabilizing member for changing a content passing space in the housing and an external space via an air passageway or the like formed in the stem.

[0004] The flow rate regulator unit and the flow rate regulator mechanism are to prevent an amount of a sprayed content per unit time to an external space from sharply varying even in any of cases where pressure of compressed gas in a container body at an early stage of the use for example is high or where the pressure in the container body is lowered owing to its use thereafter.

[0005] It is in general, in the case of an aerosol container to which content injection pressure is imparted by compressed gas such as nitrogen, carbon dioxide gas or air, that there are different injection amounts of contents per unit time between the case where gas pressure is satisfactorily high as in an early stage of the use (e.g., 7.5kgw/cm²) and the case the gas pressure is lowered due to expansion of a compressed gas space region (=reduction of content space region) in response to the degree of the use (finally lowered to 3.0kgw/cm² for example).

[0006] Unlike the compressed gas, the pressure of liquefied gas is prevented from lowering in response to the degree of the use, but the pressure changes depending on the temperature of a use environment.

[0007] It is therefore needed for a stabilized flow rate regulator to suppress a variation of an amount of spray following a pressure change of the discharge gas (compressed gas, liquefied gas), with reduced costs. The present invention is to fulfill such.

BACKGROUND ART

[0008] There are known flow rate regulators each for suppressing a change in an amount of spray of a content following the lowering of pressure of discharge gas in an

aerosol container, which are assembled in an operation button itself or in a housing itself and which are mounted on a content inflow side of a suction pipe (refer to references 1, 2).

Reference 1: Japanese Laid-Open Patent Publication No.2004-42980

Reference 2: Japanese Laid-Open Patent Publication No.2002-347863

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0009] These flow rate regulators ensure the convenience that an amount of spray of a content per unit time can be made substantially unchanged even when the pressure of content discharge gas changes.

[0010] The present invention is to further improve this property and to make the flow rate regulator a unit structure independent from other constituent elements (operation button, housing or the like) of an aerosol container, which is to be mounted on a inlet side of the suction pipe mounting part of a housing, i.e., on a rigid passageway region, which prevents content passageways being deformed and inflected (unlike the suction pipe).

[0011] The present invention is to simplify a regulator assembly work where a unit type flow rate regulator may be mounted between the housing and the suction pipe as well as to stable the spray of a content in a container by supplying the content controlled by the flow rate regulator up to the discharge hole through respective internal passageway regions of the housing, stem and operation button with no danger of deformation and inflection.

[0012] Further, the present invention is to make compact the flow rate regulator mechanism itself by communicating the moving air compression region of the flow rate stabilizing member where the content passing space in the housing changes with the external space, and hereby surely avoid an air compression problem accompanying the movement of the flow rate stabilizing member.

MEANS TO SOLVE THE PROBLEMS

[0013] The present invention solves the aforementioned problems in the following ways:

(1) Use is made of a flow rate regulator unit (e.g., flow rate regulator units 10, 20, 30 described later) mounted between a housing (e.g., a housing 41 described later) for a stem and a suction pipe (e.g., a suction pipe 42 described later) for the content in the container, the stem including a content passing hole part of an aerosol container opened and closed in response to the operation of a user and a passageway part of the aerosol container continuously extending on a downstream side for stabilizing a flow rate of a content sprayed from the aerosol container

into an external space owing to the action of discharge gas, the flow rate regulator unit comprising: a content inflow side cylindrical part (e.g., cylindrical suspension parts 11a, 21a, 37a described later) on which said suction pipe is mounted; a content outflow side cylindrical part (e.g., elongation parts 12c, 26a, 31a described later) mounted on a suction pipe corresponding cylindrical part (e.g., a small diameter part 41a described later) of the housing; a passageway space region (e.g., suction pipe 42-between groove parts 16a-space region between an internal peripheral surface of the cylinder 11 and an external peripheral surface of the inner cylinder 12-horizontal hole 12a-upper inlet part A-groove part 12b-space region between the flow rate adjusting valve 14 and the lower cover 16-internal space 13a of the piston 13) extending from said content inflow side cylindrical part to said content outflow side cylindrical part; a flow rate stabilizing member (e.g., flow rate adjusting valves 14, 24, 34 described later) moving against predetermined energizing force on the basis of the pressure of the discharge gas and changing a content passing space (e.g., upper inlet part A, lower inlet part B, inlet part C described later) of a part of said passageway space region in response to the degree of the movement; and an elastic member (e.g., coiled springs 15, 25, 35 described later) for imparting said predetermined energizing force to said flow rate stabilizing member.

(2) Use is made of a flow rate regulator mechanism of an aerosol container characterized by mounting the suction pipe on the content inflow side cylindrical part of the flow rate regulator unit according to (1) and mounting the content outflow side cylindrical part on the suction pipe corresponding cylindrical part of the housing.

(3) Use is made of a flow rate regulator mechanism of an aerosol container used in a housing (e.g., lower housing part 51, upper housing part 52 described later) for a stem (e.g., stem 61 described later) provided with a content passing hole part (e.g., horizontal hole 61a described later) opened and closed in response to the operation of a user and a content passageway part (e.g., annular passageway 61b described later) extending to a downstream side of the same for stabilizing a flow rate of a content sprayed from an aerosol container to an external space by the action of discharge gas, comprising: a passageway space region (e.g., vertical hole 51a-transverse groove-shaped part of the rib 51b-horizontal hole 53a-inlet part D-space region between the flow rate adjusting valve 56 and the lower receiving part 53-horizontal hole 54a-space region between the upper receiving part 54 and the lower housing part 51-penetration part 52b-buffer space 63-horizontal hole 61a in FIG.8) extending from a content inflow part (e.g., vertical hole 51a described later) of the housing to the content passing hole part; a flow rate stabilizing

member (e.g., flow rate adjusting valve 56, piston 55 described later) moving against predetermined energizing force on the basis of the pressure of said discharge gas and changing a content passage space (e.g., inlet part D described later) of a part of the passageway space region in response to the degree of the movement; an elastic member (e.g., coiled spring 57 described later) for imparting the predetermined energizing force to the flow rate stabilizing member; a moving air compression space region (e.g., air upper space region 58, air lower space region 59 described later) of the flow rate stabilizing member; an air passageway part (e.g., upper air passageway 61c described later) formed at least on the stem in order to communicate the moving air compression space region with an external space.

(4) Use is made of a flow rate regulator mechanism of an aerosol container in (3) wherein an operation button (e.g., operation button 60 described later) is mounted on the stem for forming an air passageway part (e.g., lower air passageway 60b described later) for external space communication extending from the air passageway part.

[0014] There are provided as objects of the present invention a flow rate regulator unit of an aerosol container and a flow rate regulator mechanism of the same both constituted as described above as well as an aerosol type products each equipped with the flow rate regulator mechanism and accommodating discharge gas and a content in the container.

EFFECT OF THE INVENTION

[0015] In accordance with the present invention, the flow rate regulator unit is constituted as a unit structure in such a way that it is fixedly mounted on a suction pipe mounting part of the aerosol container on a housing inlet side and mounted on the suction pipe, so that it is possible to simplify an assembly work of the flow rate regulator itself. Moreover, in accordance with the present invention, the suction pipe that might be deformed and inflected is incorporated or removed from the passageway part extending from the flow rate regulator to the discharge hole, so that it is possible to stably inject a container content.

[0016] Further, also in the aerosol container not equipped with the flow rate regulator function, it is possible to mount the flow rate regulator unit of the present invention between the housing and the suction pipe after separating them, more specifically, it is possible to attach afterwards the flow rate regulator function to an aerosol container constructed without the provision of a flow rate regulator.

[0017] Furthermore, the moving air compression region of the flow rate stabilizing member for changing the content passing space by the movement based on the gas pressure in the container and on predetermined elas-

tic force communicates with the external space, so that it is possible to surely avoid an air compression problem accompanying the movement of the flow rate stabilizing member even if the air compression region has small capacity and make compact the flow rate regulator mechanism itself.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG.1 is a sectional view illustrating a flow rate regulator mechanism (No.1, stationary mode) (embodiment 1);

FIG.2 is a sectional view illustrating a specific timing state (when then upper inlet part A is opened) in the flow rate regulator mechanism (embodiment 1);

FIG.3 is a sectional view illustrating the flow rate regulator mechanism (No.2, stationary mode) (Embodiment 2);

FIG.4 is a sectional view illustrating a specific timing state (when a lower inlet part B is opened) (Embodiment 2) in the flow rate regulator mechanism in FIG. 3;

FIG.5 is a sectional view illustrating the flow rate regulator mechanism (No.3, stationary mode) (Embodiment 3);

FIG.6 is a sectional view illustrating a specific timing state (when the inlet part C is opened) in the flow rate regulator mechanism in FIG.5 (Embodiment 3);

FIG.7 is a sectional view illustrating the flow rate regulator mechanism in (No.3, stationary mode) (Embodiment 4); and

FIG.8 is a sectional view illustrating a specific timing state (when the inlet part D is opened) in the flow rate regulator mechanism in FIG.7 (Embodiment 4).

DESCRIPTION OF SYMBOLS

[0019] In the following description, each constituent element with a reference number having any letter of the alphabet (e.g., cylindrical suspension part 11a) is a part of the constituent element with the reference number not having any letter of the alphabet (e.g., cylinder 11).

[0020] The following reference numbers 10 to 16a, and A are used in FIGs.1 and 2.

10: flow rate regulator unit (flow rate regulator mechanism: No.1);

11: cylinder;

11a: cylindrical suspension part for mounting a suction pipe 42 described later;

12: inner cylinder fixed in the cylinder 11 to form a content passageway between the inner cylinder and the cylinder;

12a: horizontal hole for passing of a content;

12b: groove part for passing of a content formed intermittently and vertically of a lower internal peripheral

eral surface of the inner cylinder;

12c: cylindrical elongation part for mounting the inner cylinder 12 on a housing 41 described later;

13: piston fitted to a flow rate adjusting valve 14 described later;

13a: passageway of a content in the piston;

14: flow rate adjusting valve moving vertically in a united manner with the piston 13;

14a: annular edge part for adjusting a cross section (the case of a cross sectional area $\neq 0$ included) of an upstream side inlet part of the groove part for

passing of a content (an illustrated vertical length of the inlet part) by the action of compressed gas in a

container body and a coiled spring 15 described later by changing a vertical contact position with respect

to the groove part 12b;

14b: lower surface part;

15: coiled spring for energizing the piston 13 downward;

16: lower cover including a plurality of radial circumferential groove part and a central recessed part following on the former and mounted on a lower opening part of the inner cylinder 12;

16a: groove part for passage of a content formed

intermittently and radially of an outer bottom surface of the lower cover;

16a: groove part for passage of a content formed intermittently and radially of an outer bottom surface of the lower cover;

A: upper inlet part of the groove part 12b of the inner cylinder 12.

[0021] The following reference numbers 20 to 26b and B are used in FIGs.3 and 4, respectively

20: flow rate regulator unit (flow rate regulator mechanism: No.2);

21: cylinder;

21 a: cylindrical suspension part for mounting a suction pipe 42 described later;

22: sheath-shaped part fixed in the cylinder 21 for forming a content passageway between the sheath-shaped part and the cylinder;

22a: transverse hole for passing of a content;

22b: groove part formed intermittently and vertically of an upper internal peripheral surface of the sheath part for ensuring a flow rate regulator portion;

22c: groove part for passage of a content formed

intermittently and radially of an outer bottom surface of the sheath part;

23: piston fitted to a flow rate adjusting valve 24 described later;

23a: upper surface of the piston (bottom surface of the upper recessed part);

24: flow rate adjusting valve movable vertically in a united manner with the piston 23;

24a: annular edge part for adjusting a cross section (the case of a cross sectional area $\neq 0$ included) of an upstream side inlet part of the groove part for

passing of a content (illustrated vertical length of the inlet part) by the action of compressed gas in a con-

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tainer body and a coiled spring 25 described later by changing a vertical contact position with respect to the groove part 22b;
 24b: upper surface side part of the flow rate adjusting valve;
 25: coiled spring for energizing the piston 23 upward;
 26: connection member for mounting the cylinder 21 and the sheath part 22 etc. in the integrated manner on a housing 41 described later;
 26a: extension part (cylindrical part) for mounting the connection member on the housing 41;
 26b: slit for passing of a content;
 B: lower inlet part of the groove part 22b of the sheath part 22.

[0022] The following reference numbers 30 to 37b, and C will be used in FIGs.5 and 6.

30: flow rate regulator unit (flow rate regulator mechanism: No.3);
 31: cylinder;
 31a: cylindrical elongation part for mounting the cylinder on a housing 41 described later;
 33: piston fitted to a flow rate adjusting valve 34 described later;
 33a: passageway of a content in the piston;
 33b: lower surface part of the piston 33 for receiving pressure of the compressed gas;
 34: flow rate adjusting valve movable vertically in a united manner with the piston 33;
 34a: slit in the flow rate adjusting valve 34 for passing of a content;
 34b: shoulder part for adjusting a flow rate of a content by making contact with or separating away from a lower surface part 36a of a bushing 36 described later;
 34c: transverse hole for passing of a content;
 34d: passageway of a content;
 35: coiled spring for energizing the piston 33 downward;
 36: bushing fixed to a joint 37 described later for forming a content passageway between the bushing and the flow rate adjusting valve 34;
 36a: lower surface part;
 37: joint fitted to a lower end side inner peripheral surface of the cylinder 31 and integrated with the cylinder;
 37a: cylindrical suspension part for mounting a suction pipe 42 described later;
 37b: a flow receiving part striding between opposed parts of the inner peripheral surface of the joint;
 C: inlet part between the shoulder part 34b of the flow rate adjusting valve 34 and the lower surface part 36a of the bushing 36.

[0023] The following reference numbers 41, 41a will be used in FIG-s.1 to 6 and reference number 42 will be used in FIGs. 1 to 8.

41: housing;
 41a: small diameter part;
 42: suction pipe.

5 **[0024]** The following reference numbers 50 to 66 and D will be used in FIGs.7 and 8.

50: flow rate regulator mechanism (No.4);
 51: bottomed cylindrical lower housing part constituting the housing;
 51a: vertical hole for passing of the content;
 51b: rib (protruded part) formed intermittently radially of the bottom surface part;
 51c: cylindrical suspension part for mounting the suction pipe 42;
 52: bottomed cylindrical upper housing part fitted to the lower housing to likewise constitute the housing;
 52a: central opening part in the bottom surface;
 52b: a plurality of penetration parts formed intermittently on the bottom edge part;
 53: sheath-shaped lower receiving part held on an inner bottom surface (rib 51b) and internal peripheral surface of the lower housing part 51 for accommodating and guiding a piston 55 described later;
 53a: horizontal hole for flow rate regulator;
 53b: upper end side annular flange part;
 54: bottomed cylindrical upper receiving part held between the annular flange part and the outer bottom surface of the upper housing part 52 for accommodating and guiding a flow rate adjusting valve 56 described later;
 54a: horizontal hole for passing of a content;
 54b: central opening part of the ceiling surface;
 55: cylindrical piston;
 55a: reverse skirt-shaped part in close contact with the internal peripheral surface of the lower receiving part 53;
 55b: internal passageway for air movement;
 56: flow rate adjusting valve fitted to the piston to move vertically;
 56a: lower skirt-shaped part formed on a lower end side for exhibiting a valve action of the flow rate regulator between the lower skirt-shaped part and the horizontal hole 53a and making close contact with the internal peripheral surface of the lower receiving part 53 other than the horizontal hole;
 56b: upper skirt-shaped part in close contact with the internal peripheral surface of the upper receiving part 54;
 56c: annular ceiling surface for receiving upward gas pressure;
 57: coiled spring for flow rate regulator disposed between the ceiling surface of the upper receiving part 54 and the upper recessed part of the flow rate adjusting valve 56 for energizing downward the flow rate adjusting valve;
 58: upper air space region in which the coiled spring is accommodated;

59: lower air space region formed between the bottom surface part of the lower receiving part 53 and the piston 55;
 60: operation button;
 60a: content injection passageway extending longitudinally for spraying a content;
 60b: lower air passageway extending vertically for making the accommodation space 58 of the coiled spring 57 communicate with the external space;
 60c: groove-shaped part formed in an upper surface part of the operation button in a mode extending to the lower air passageway (e.g., one including a connection groove between a spiral groove part and a concentric groove part);
 61: stem fitted to the operation button 60 for exhibiting the valve action for injection of a content;
 61a: content passing horizontal hole;
 61b: annular passageway extending vertically close to the horizontal hole for spraying a content;
 61c: upstream side air passageway with its upper end part fitted to the downstream side air passageway 60b of the operation button 60 and with its lower end part entering the accommodation space 58 of the coiled spring 57;
 62: coiled spring disposed between the bottom surface of the upper housing part 52 and a step part of the stem 61 for spraying a content for energizing vertically the stem;
 63: buffer space for accommodating the coiled spring and a content;
 64: well known stem gasket for the horizontal hole 61a in the stem 61;
 65: annular rubber held between the upper housing part 52 and the upper receiving part 54 while making close contact with the external peripheral surface of a lower side of the stem for exhibiting a sealing action between the air space region 58 and the buffer space 63 for a content;
 66: well known mounting cap for holding the upper housing part 52 and the stem gasket 64 while engaging with them; and
 D: inlet part between the horizontal hole 53a of the lower receiving part 53 and the skirt-shaped part 56a of the flow rate adjusting valve 56.

BEST MODE FOR EMBODYING THE PRESENT INVENTION

[0025] In what follows, best modes for embodying the present invention will be described with reference to FIGs.1 to 8.

[0026] The first principal feature of the present invention (refer to FIGs. 1 to 6): is that a flow rate regulator is provided in a demountable unit style which can be equipped between the housing and the suction pipe of the aerosol container, entirely different from the conventional manner where a regulator is formed in any of the essential elements of the container, such as a discharge

head (or operation button), a stem, a housing, or a suction pipe.

[0027] It is hereby possible to add the flow rate regulator function to an aerosol container even in the case of the aerosol container not equipped with the flow rate regulator function through such a simplified work that the flow rate regulator unit is attached afterwards between the housing and the suction pipe after disengaging a fitted part therebetween.

[0028] The second principal feature (refer to FIGs.7, 8) of the present invention is as follows: The moving air compression region of the flow rate stabilizing member for changing the content passing space by the movement of the member based on the gas pressure in the container and predetermined elastic force is made to communicate with an external space.

[0029] It is hereby possible to surely avoid the air compression problem of the flow rate stabilizing member without providing a large capacitance moving air compression region and to make compact the flow rate regulator mechanism.

[0030] The constituent elements of the flow rate regulator units 10, 20, 30 and the flow rate regulator mechanism 50 (excepting the coiled springs 15, 25, 35, 57, 62, stem gasket 64, annular rubber 65, and mounting cap 66), and the housing 41 and suction pipe 42 or the like are made of plastic such as polypropylene, polyethylene, polyacetal, nylon, polybutylene terephthalate, etc. The coiled springs 15, 25, 35, 57, 62 are made of stainless or plastic. Materials of the stem gasket 64 and the annular rubber 65 are acrylonitrile-butadiene rubber (NBR), Butyl-rubber (IIR), and other rubber-made sealing members. Material of the mounting cap 66 is tin or an aluminum material.

[0031] Instead of the coiled springs 15, 25, 35, 57, 62 there may be used arbitrary elastic members such as various types of springs and leaf springs.

[0032] Although the present invention employs both of compressed gas and liquefied gas as the content discharge gas as described above, in the following the compressed gas will be employed for brevity of the description.

Embodiment 1

[0033] An inner cylinder 12 of a flow rate regulator unit 10 illustrated in FIGs.1 and 2 has an elongation section 12c for fitting over a small diameter section 41a of an existing housing 41. A cylinder 11 for forming a content passageway between it and the inner cylinder 12 has a cylindrical suspension part 11a for mounting an existing suction pipe 42.

[0034] The inner cylinder 12 contains a piston 13 energized downward with a coiled spring 15 and a flow rate adjusting valve 14 fitted to and united with the piston 13.

[0035] In a stationary mode illustrated in FIG. 1, an upper inlet part A, in space regions for passageway to the housing 41 is set to a substantially closed state or a

narrow state by the flow rate adjusting valve 14, in which the content flow route is designed to follow in the order of suction pipe 42, the space region formed by groove parts for passage of a content 16a, -a space region between inner annular surface of a cylinder 11 and an outer annular surface of an inner cylinder 12, a horizontal hole 12a, the upper inlet part A, groove part 12b, a space region between a flow rate adjusting valve 14 and a lower cover 16, passageway 13a of a piston 13.

[0036] The reason is as follows: A content passing hole part in a stem (not shown) following the passageway space region is closed with a well known stem gasket to bring pressure in the passageway space region to the same high pressure (compared with the atmospheric pressure) as in the interior of the container. The high pressure acts on a wide lower surface part 14b of the flow rate adjusting valve 14 to push up the flow rate adjusting valve and the piston 13 against the energizing force of the coiled spring 15.

[0037] Once a user pushes an operation button to set the operation to an actuation mode, for example, the content passing hole part of the stem changes from the so far closed state to an open state.

[0038] By opening of the stem hole part, the content existent in a downstream passageway space region lower than the upper inlet part A (nearly equal to a part of the passageway space region + housing 41) is discharged to the external space through the passageway part in the stem.

[0039] As a result, upward pressure, that pushes up the flow rate adjusting valve 14 and the lower surface part 14b of the piston 13 and the like lowers, so that the flow rate adjusting valve, and the like move downward by the action of the coiled spring 15 and the operation changes to a state where the upper side inlet part A is opened as illustrated in FIG. 2.

[0040] By changing of the upper side inlet part A to the open state, the inside of the container and the external space are communicated with each other through the foregoing passageway space regions and the stem hole part to discharge the content in the container to the external space.

[0041] Following the discharge operation, the pressure in a lower space (a part of the foregoing passageway space region) of the lower surface part 14b of the flow rate adjusting valve 14 is also raised to push up the flow rate adjusting valve and the piston 13 into the state illustrated in FIG. 1. The above operation is repeated recursively thereafter to change a state illustrated in FIG. 2 and return to the state illustrated in FIG. 1.

[0042] In the aforementioned operation mode, time of the transition from FIG. 1 to FIG. 2 (the total timing of the substantially closed state of the upper side inlet part A) is a so-called constant that is mainly determined by the energizing force of the coiled spring 15 and in contrast timing of the opposite transition from FIG. 2 to FIG. 1 (the total time of the open states of the upper side inlet part A) is a so-called variable based on gas pressure.

[0043] Under the present operation environment, when the gas pressure in the container body is high, the flow rate adjusting valve 14 has larger driving force (the foregoing gas pressure) to push the valve position as shown in FIG.2 to that in FIG.1 so that the number of times of up and down movements of the flow rate adjusting valve per unit time is also larger (i.e., the total time of the substantially closed state of the upper side inlet part A is long; and when pressure of the compression gas becomes lower owing to the discharge operation of the content, the foregoing driving force is also reduced so that the number of times of the up and down movements of the flow rate adjusting valve 14 per unit time becomes small (i.e., the total time of the substantially closed states of the upper side inlet part A is short).

[0044] In other words, a substantially closed state time interval t1 (continuation time in FIG.1) of the upper side inlet part A per one time of the up and down movement is a substantially constant value based on the energizing force of the coiled spring 15, and in contrast an open state time interval t2 (continuation time in FIG.2) per one time is shorter as gas pressure in the container body becomes higher.

[0045] More specifically, a time fraction that the inlet part A, which is a part of the content passageway, becomes the open state, is smaller as the pressure of the gas is higher like the compressed gas in an early time of use.

[0046] Consequently, in the high pressure gas state where the number of times of the up and down movements of the flow rate adjusting valve 14 per unit time is large (the time interval t2 of the foregoing open state is short), the open state time per unit time is shorter than in the low pressure gas state.

[0047] Also, the substantially closed state time interval t1, made substantially constant irrespective of the gas pressure in the aforementioned description, when the upper side inlet part A of FIG.1 changes to a wide state of FIG.2, is qualitatively related to a time interval where pressure acting, till then, on the lower surface part 14b of the flow rate adjusting valve 14, lowers to a predetermined value corresponding to the energizing force of the coiled spring 15, so that it is more lengthened as the pressure (gas pressure in the container) is higher.

[0048] Whatever the case may be, variations of flow rates of a container content discharged to the external space are suppressed by automatic differentiation of the total times of the open states of the upper side inlet part A per unit time responsive to the gas pressures in the container and the energizing force of the coiled spring 15.

EMBODIMENT 2

[0049] A flow rate regulator unit 20 illustrated in FIGs. 3 and 4 includes a connection member 26 for integrating a cylinder 21 and a sheath-shaped part 22 or the like and fitting it over a small diameter part 41a of the housing 41.

[0050] The cylinder 21 includes a cylindrical suspen-

sion part 21a for mounting a suction pipe 42, and the sheath-shaped part 22 contains the piston 23 energized upward by the coiled spring 25 and the flow rate adjusting valve 24 fitted to the piston.

[0051] In the stationary mode illustrated in FIG.3, an inlet part B of the passageway space region leading to the housing 41 from the internal space of the container body (not shown) and the suction pipe 42, is set to a substantially closed state or a narrowed state by the flow rate adjusting valve 24 more specifically, in such as route as " between leaves 22c-a space region between the cylinder 21 and the sheath part 22-a horizontal hole 22a-the inlet part B-a groove part 22b-a space region between the connection member 26 and the upper surface side part 24b of the flow rate adjusting valve 24-a slit 26b of the connection member 26.

[0052] The reason is as follows: The content passage hole part of the stem following the passage space region is closed with a well known stem gasket so that pressure in the passage space region is high (compared with the atmospheric pressure), similar to the inside of the container. More specifically, the high pressure acts on the upper surface 23a of the piston 23 or the like to press down the piston and the flow rate adjusting valve 24 against the energizing force of the coiled spring 25.

[0053] Once a user presses an operation button for example to set the operation to the operation mode, the content passing hole part of the stem changes from the closed state so far to the opened state.

[0054] By opening of the stem hole part the content existent in the passageway space region ($\equiv$ a part of the foregoing passageway space region + housing 41) on a downstream side from the lower inlet part B before that, is discharged to an external space via the passageway of the stem.

[0055] As a result of the aforementioned operation, the pressure that presses the upper surface 23a of the piston 23 downward is lowered so that the piston is moved upward by the action of the coiled spring 25, permitting the inlet part to change to a state where the inlet part B is opened as illustrated in FIG.4.

[0056] The change of the inlet part B to the opened state causes the container inside and the external space to be communicated via the aforementioned passageway space region and the stem hole part, the container content being hereby discharged to the external space.

[0057] Following the discharge operation, the pressure in an upper side space (a part of the aforementioned passageway space region) of the upper surface 23a of the piston 23 becomes high, and the piston is pressed down with the pressure to return to a state in FIG.3. Thereafter, the foregoing operation is repeated recursively to change to the state in FIG.4 and to return to the state in FIG.3.

[0058] Also in the case of the flow rate regulator unit 20 in FIGs.3 and 4 there are repeated a closed state or a narrow state, and a wide state of an effective passing cross section of a content at the inlet part B in the same

fashion as that in FIGs. 1 and 2

[0059] In the repetitive operation a time interval till the inlet part B is closed (or becomes the narrow state) since its opening, namely, a time interval the pressure acting on the upper surface 23a of the piston 23 once becomes low owing to the opening of the stem hole part and then recovers to a degree to make the piston move downward against the energizing force of the coiled spring 25 is short when the gas pressure in the container is high, and is reversely long as the gas pressure becomes low, hereby stabilizing the amount of discharge of the content with respect to a change in the gas pressure in the container.

[0060] This operation is the same as that in the case in FIGs.1 and 2. But, it is noticed that the piston 23 (and the flow rate adjusting valve 24) and the coiled spring 25 move oppositely to the regulator unit 10.

[0061] Further, also a time interval when the inlet part B in FIG.3 changes to a wide state in FIG.4 relates to a time interval when the pressure acting, till then, on the upper surface 23a of the piston 23 lowers to a predetermined value corresponding to the energizing force of the coiled spring 25 and is hence prolonged as the pressure is high.

[0062] In such a manner, as the gas pressure in the container is higher, a transfer time (=keeping time interval in FIG.3) of the inlet part B from FIG.3 to FIG.4 in the actuation mode is increased, and reversely a transfer time (=keeping time interval in FIG.4) from FIG.4 to FIG.3 is shortened.

[0063] More specifically, for the higher gas pressure in the container by making a ratio of the inlet part B occupying, per unit time, the wide state in FIG.4 smaller than a case at low pressure, a flow rate of a content per unit time discharged to an external space is stabilized irrespective of the gas pressure.

EMBODIMENT 3

[0064] A cylinder 31 of a flow rate regulator unit 30 illustrated in FIGs.5 and 6 includes a cylindrical elongation part 31a for fitting over the small diameter part 41a of the housing 41.

[0065] The cylinder 31 includes a joint 37 attached thereto for mounting the suction pipe 42 and contains therein a piston 33 energized downward by the coiled spring 35, a flow rate adjusting valve 34, and a bush 36 that forms an inlet part C between lower surface part 36 and the flow rate adjusting valve.

[0066] The joint 37 includes in its internal space a flow receiving part 37b for suppressing the force of a content flowing in from the suction pipe 42 upstream the flow rate adjusting valve 34.

[0067] In the stationary mode illustrated in FIG.5, there is setting an inlet part C in a passageway space region to the housing 41 to a substantially closed state or a narrow state by the flow rate adjusting valve 34 in such a route as "a slit 34a of the flow rate adjusting valve 34-the inlet part C-a space region between the flow rate adjust-

ing valve 34 and the bushing 36-horizontal hole 34c-passageway 34d-passageway 33a" from the internal space in the container body (not shown) and from the suction pipe 42.

[0068] The reason is as follows: The content passing hole part of the stem (not shown) adjacent to the passageway space region is closed with a well known stem gasket to make the pressure in the passageway space region the same high pressure (compared with the atmospheric pressure) as in the container. More specifically, the high pressure acts on the lower surface part 33b of the piston 33 to push up the piston and the flow rate adjusting valve 34 against the coiled spring 35.

[0069] Once a user sets the operation to the actuation mode by pressing an operation button for example, the content passing hole part of the stem changes its state from a so far closed state to an open state.

[0070] By the opening of the stem hole part a content contained in a passageway space region (=a part of the passageway space region + housing 41) located downstream the inlet part C so far is discharged to an external space via the passageway part of the stem.

[0071] As a result, since the pressure pushing up the lower surface part 33b of the piston 33 is lowered, the piston moves downward by the action of the coiled spring 35, and this operation changes the inlet part C to a state where the inlet part C is opened as illustrated in FIG.6.

[0072] By changing of the inlet part C to the open state the interior of the container and the external space are communicated with each other via the foregoing passageway space region and the stem hole part to discharge the content in the container to the external space.

[0073] Following the above discharge operation pressure in a lower space (a part in the passageway space region) of the lower surface part 33b of the piston 33 is also increased to push up the piston into a state illustrated in FIG.5. Thereafter, it is recursively implemented that the operation repeats as described above to change to a state illustrated in FIG.6 and again return to the state in FIG.5.

[0074] Also the case of the flow rate regulator unit 30 illustrated in FIGs. 5, 6 repeats the closed state or narrowed state, and wide state of an effective passing cross section of a content at the inlet part C as in the respective cases in FIGs.1, 2, 3, and 4.

[0075] Although based on the repeated operation it is intended to stabilize the amount of discharge of a content with respect to a change in gas pressure in the container, description on a relevance between the movement of the piston 33 (and the flow rate adjusting valve 34) at that time and the gas pressure corresponds to the aforementioned description concerning the flow rate regulator units 10, 20 in FIGs.1 to 4. It is however noted that directions of the movements of the piston 33 (and the flow rate adjusting valve 34) and the coiled spring 35 are opposite to that of the regulator unit 20.

[0076] More specifically, it is intended for a flow rate of a content per unit time discharged to the external space

to be stabilized with respect to a change in the gas pressure by further reducing a ratio of time which the inlet part C is the open state per unit time (ratio of passable time of the content) in FIG.6 for the high gas pressure in the container than the case at the time of the low pressure.

EMBODIMENT 4

[0077] In the case of a flow rate regulator mechanism 50 illustrated in FIGs. 7 and 8, an air upper space region 58 and an air lower space region 59 in the housing which change self volumes in response to the movement of "a piston 55 + a flow rate adjusting valve 56" for a flow rate regulator are communicated to the external space by an upstream side air passageway 61c of a stem 61 and a downstream side space region 60b of an operation button 60 respectively

[0078] Accordingly, even though the upper air space region 58 and the lower air space region 59 are not made a large capacity space respectively, there occurs no problem of the compression of air following the movements of "the piston 55 + flow rate adjusting valve 56". More specifically, the relevant piston can move smoothly vertically in the figure in response to the magnitude of injecting gas pressure.

[0079] The upstream side air passageway 61c may be formed to open toward a stem's outer peripheral surface located between a mounting cap 66 and an operation button 60 at its output side. In this case, the downstream side air passageway 60b of the operation button 60 is unnecessary. Further, the upstream side air passageway is an air exclusive passageway, different from the content injecting passageway.

[0080] The flow rate regulator mechanism 50 substantially comprises:

a housing (=bottomed cylindrical lower housing part 51 + bottomed cylindrical upper housing part 52);
a passageway setting member fixed to the inside of the housing for setting the content passing space region (=sheathed lower receiving part 53 + bottomed cylindrical upper receiving part 54);
a flow rate regulator member moving up and down, guided by an internal peripheral surface of the passageway setting member (=piston 55 + flow rate adjusting valve 56);
a coiled spring 57 for energizing the flow rate regulator member downward;
an operation button 60 having the downstream side air passageway 60b aside from the content injection passageway 60a;
a stem 61 presenting a well known valve action and including the content passing horizontal hole 61a extending from the buffer space 63 to the injection passageway 60a and the annular passageway 61b, and the upstream side air passageway 61c extending from the upper air space region 58 to the downstream

side air passageway 60b; and
a coiled spring 62 for energizing upward the stem.

[0081] Tip end parts of the reverse skirt-shaped part 55a of the piston 55 and of the lower skirt-shaped part 56a of the flow rate adjusting valve 56 make close contact with the internal peripheral surface of the lower receiving part 53 (other than the horizontal hole 53a for the flow rate regulator), and a tip end part of the upper skirt-shaped part 56b of the flow rate adjusting valve 56 makes contact with the internal peripheral surface of the upper reception part 54.

[0082] More specifically, an air reservoir space in a kind, of the air upper space region 58, internal passageway 55b, and lower air space region 59 is communicated to the external space in an air exclusive passageway mode sealed from the content injection passageway (refer to FIG.8).

[0083] The content injection passageway extending from the suction pipe 42 to the external space substantially consists of "vertical hole 51a of the lower housing part 51-horizontal groove-shaped part of the rib 51b-horizontal hole 53a-inlet part D-space region between the flow rate adjusting valve 56 and the lower receiving part 53-horizontal hole 54a-space region between the upper receiving part 54 and the lower housing part 51-penetration part 52b-buffer space 63-horizontal hole 61a-annular passageway 61b-longitudinal passageway 60a".

[0084] In the stationary mode in FIG. 7, the inlet part D in the content injection passageway is set to a substantially closed state or a narrow state by the flow rate adjusting valve 56.

[0085] The reason is that the horizontal hole 61a of the stem 61 constituting the injection passageway is closed by the well known stem gasket 64, and so pressure in the injection passageway located downstream the horizontal hole is the same high pressure as that in the container. More specifically, the high pressure acts on the annular ceiling surface 56c of the flow rate adjusting valve 56 (and the piston 55) or the like to push up the flow rate adjusting valve against the energizing force of the coiled spring 57. An upward movement range of the flow rate adjusting valve 56 is limited by a protruded part formed on a ceiling surface edge of the upper receiving part 54.

[0086] When a user presses the operation button 60 to set the operation to the actuation mode (refer to FIG. 8), the content passing horizontal hole 61 a of the stem 61 changes its state from the so far closed state to the open state.

[0087] It is herein noted that even if a just above portion of the downstream side air passageway 60b is blocked up by a hand of the user upon the operation button 60 being pressed, the air passageway is communicated to the external space via the groove-shaped part 60c in the upper surface of the operation button.

[0088] By opening of the stem's horizontal hole, the content in the injection passageway located so far on a just upstream side of the horizontal hole (e.g., a passage-

way region from the horizontal hole 61a to the inlet part D) is discharged to the external space via the annular passageway 61b and the longitudinal content injection passageway 60a.

[0089] As a result, pressure pushing upward the annular ceiling surface 56c of the flow rate adjusting valve 56 is lowered so that the flow rate adjusting valve and the piston 55 move downward by the action of the coiled spring 57 and change the state of the inlet part D to opened one as illustrated in FIG.8.

[0090] By changing of the inlet part D to the open state the inside of the container and the external space are communicated to each other via the injection passageway, and the content in the container is discharged to the external space.

[0091] Following the discharge operation, pressure in the lower space of the annular ceiling surface 56c (a part of the injection passageway) also gets high so that the flow rate adjusting valve 56 and the piston are pushed up with the pressure and substantially return to the state in FIG.7. Thereafter it is recursively implemented that the operations described above are repeated to change to the state in FIG.8 and substantially return to the state in FIG.7.

[0092] Also in the case of the flow rate regulator mechanism 50 illustrated in FIGs.7 and 8 the closed state or narrowed state, and wide state of an effective passing cross section of the content at the inlet part D are repeated as those in FIGs.1 to 6.

[0093] Although it is intended to stabilize the discharge amount of the content with respect to a change in the gas pressure in the container on the basis of the repeated operation, description on relevance between the movements of the flow rate adjusting valve 56 and the piston 55 and the gas pressure corresponds to the description in the flow rate regulator units 10, 20, 30 in FIGs.1 to 6. But, moving directions of the flow rate adjusting valve 56 (and the piston 55) and the coiled spring 57 are opposite to that of the regulator unit 20.

[0094] More specifically, it is intended for high gas pressure in the container to stabilize a flow rate of a content per unit time discharged to the external space with respect to a change in the gas pressure by further reducing an ratio of the inlet part D allowed to be in the open state per unit time in FIG.8 ($\equiv$ a ratio of passable time of the content) than the case of low pressure.

[0095] It is obvious that the actions of the flow rate regulators (units) in FIGs.1 to 8 to a change in the gas pressure in the container are the same as in liquefied gas in the aerosol container.

EMBODIMENT 5

[0096] Objects of contents in the container include various kinds of properties such as liquid, expandable (foamed), pasty, gel, powdery or the like.

[0097] Aerosol products to which the present invention is applied include various kinds of applications such as

detergents, cleaning agent, anhidrotics, coolant, muscle antflash agent, hair styling agent, hair treatment agent, hairdye, hair-growth drug, cosmetic, shaving foam, food-stuff, droplet like (vitamine, etc.), medical supply, quasi-drugs, coating, gardening supply, rejectant (insecticide), cleaner, odor eliminating agent, washing starch, polyurethane foam, fire extinguisher, adhesive agent, and lubricant.

[0098] Contents contained in the container body include powdery, oil component, spirits, detergent, polymer, effective components in response to various applications, etc., for example.

[0099] As the powdery materials there are used metal salts powder, inorganic powders, and resin powders, including for example talc, kaolin, aluminium hydroxychloride (aluminium salt), calcium alginate, gold powder, silver powder, mica, carbonate, barium sulfate, cellulose, and mixtures thereof.

[0100] As the oil components there are used silicone oil, palm oil, eucalyptus oil, camellia oil, olive oil, jojoba oil, paraffin oil, myristic acid, palmitic acid, stearic acid, linoleic acid, and linolenic acid or the like.

[0101] As the alcohols, there are used lower monohydric alcohol such as ethanol, higher monohydric alcohol such as lauryl alcohol, and polyalcohol such as ethylene glycol.

[0102] As the detergent there are used anionic detergent such as sodium lauryl sulfate, nonionic detergent such as polyoxyethylene oleyether, lauryldimethylaminoacetic acid betaine, and cationic detergent such as alkyltrimethylammonium chloride.

[0103] As the polymers there are used methyl cellulose, gelatine, starch, and casein, etc.

[0104] As the effective components in response to various applications there are used antflash pain killer such as methyl salicylate and indomethacin, bactericidal agents such as sodium benzoate and cresol, pest insect-repelling agents such as pyrethroids and diethyltoluamide, anhidrotics such as zinc oxide, algeficient such as camphor and menthol, antiasthmatic drug such as ephedrine and adrenalin, edulcorant such as sucralose and aspartame, adhesive agent and coating such as epoxy resin and urethane, dye such as para-phenylenediamine and aminophenol, and extinguishant such as ammonium dihydrogen phosphate and sodium/potassium hydrogen carbonate or the like.

[0105] There can be used, additionally to the aforementioned contents, suspensions, ultraviolet absorbers, emulsifier, humectants, antioxidant, and sequestering agent, etc, too.

[0106] As the content discharge gas in the aerosol type articles, there are used compressed gases such as carbon dioxide gas, nitrogen gas, compressed air, oxygen gas, noble gas, and mixed gas thereof, and liquefied gases such as liquefied oil gas, dimethyl ether, and fluorocarbon, etc.

Claims

1. A flow rate regulator unit mounted between

(i) a housing for a stem equipped with a content passing hole part of the container opened and closed in response to the operation of a user and a passageway of the aerosol container continuously extending downstream and (ii) a suction pipe for a content in an aerosol container, for stabilizing a flow rate of the content injected from the aerosol container to an external space with the aid of the action of discharge gas, comprising:

a content inflow side cylindrical part connected to said suction pipe is mounted;
a content outflow side cylindrical part connected to said housing;
a passageway space region extending from said content inflow side cylindrical part to said content outflow side cylindrical part;
a flow rate stabilizing member moving against predetermined energizing force on the basis of the pressure of said discharge gas and changing a content passing space of a part of said passageway space region in response to the degree of the movement; and
an elastic member for imparting said predetermined energizing force to said flow rate stabilizing member.

2. A flow rate regulator mechanism of an aerosol container, **characterized by** mounting said suction pipe on said content inflow side cylindrical part of the flow rate regulator unit according to claim 1 and mounting said content outflow side cylindrical part of said regulator unit on said housing.

3. A flow rate regulator mechanism of an aerosol container used in a housing for a stem provided with a content passing hole part, opened and closed in response to the operation of a user and a content passageway, for stabilizing a flow rate of a content injected from an aerosol container to an external space by the action of discharge gas, comprising:

a passageway space region extending from a content inflow part of said housing to said content passing hole part;
a flow rate stabilizing member moving against predetermined energizing force on the basis of the pressure of said discharge gas and changing a content passing space of a part of said passageway space region in response to a movement thereof,

an elastic member for imparting said predetermined energizing force to said flow rate stabilizing member;
a changeable air compression space region for moving of said flow rate stabilizing member;
an air passageway part formed at least on said stem in order to make said changeable air compression space region communicate with an external space.

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4. A flow rate regulator mechanism of an aerosol container according to claim 3 wherein an operation button is mounted on said stem for forming an air passageway part for external space communication extending from said air passageway part.

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5. An aerosol product container comprising a flow rate regulator mechanism according to claims 2 to 4 and a discharge gas and a content in the container.

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FIGURE 1

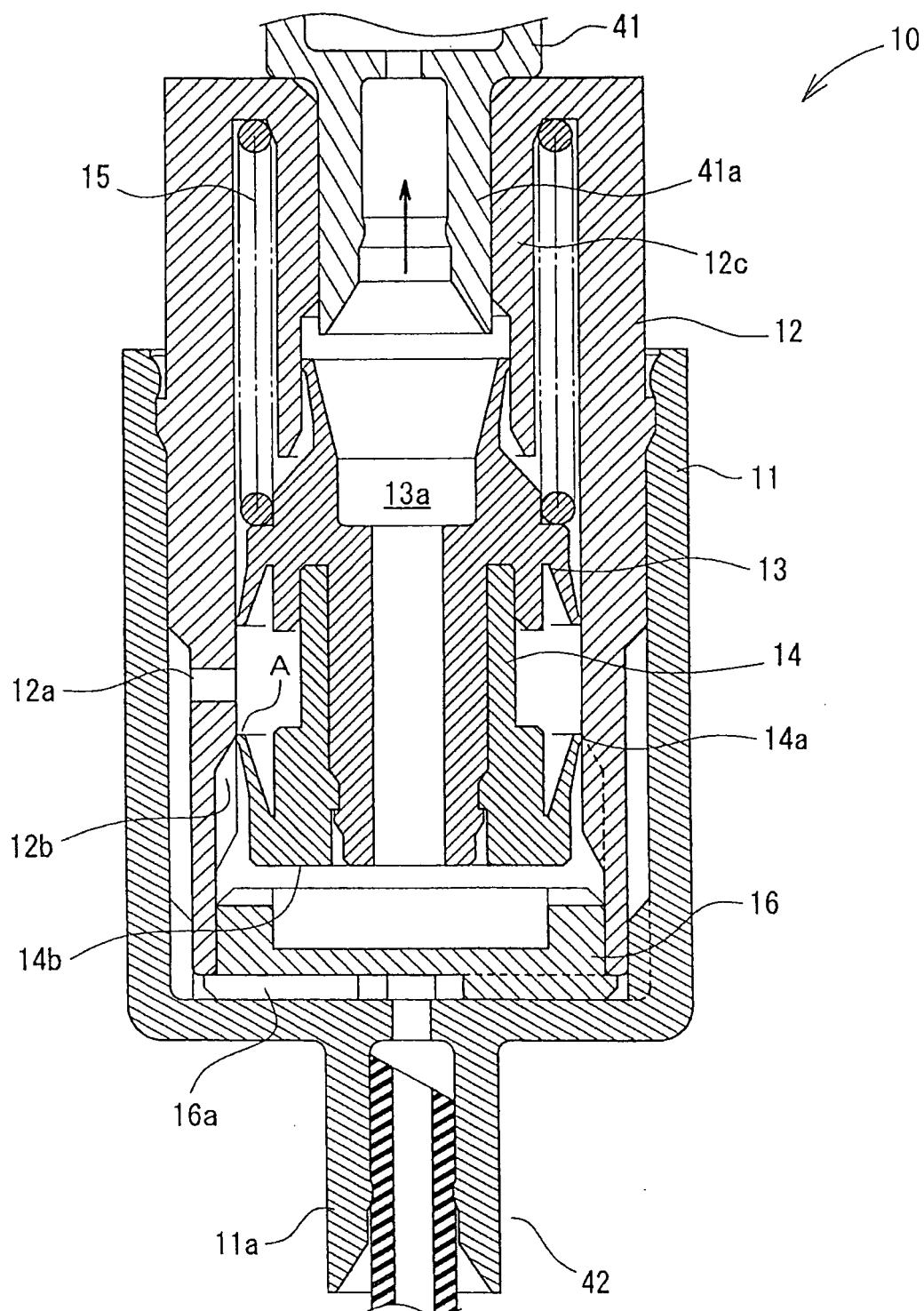


FIGURE 2

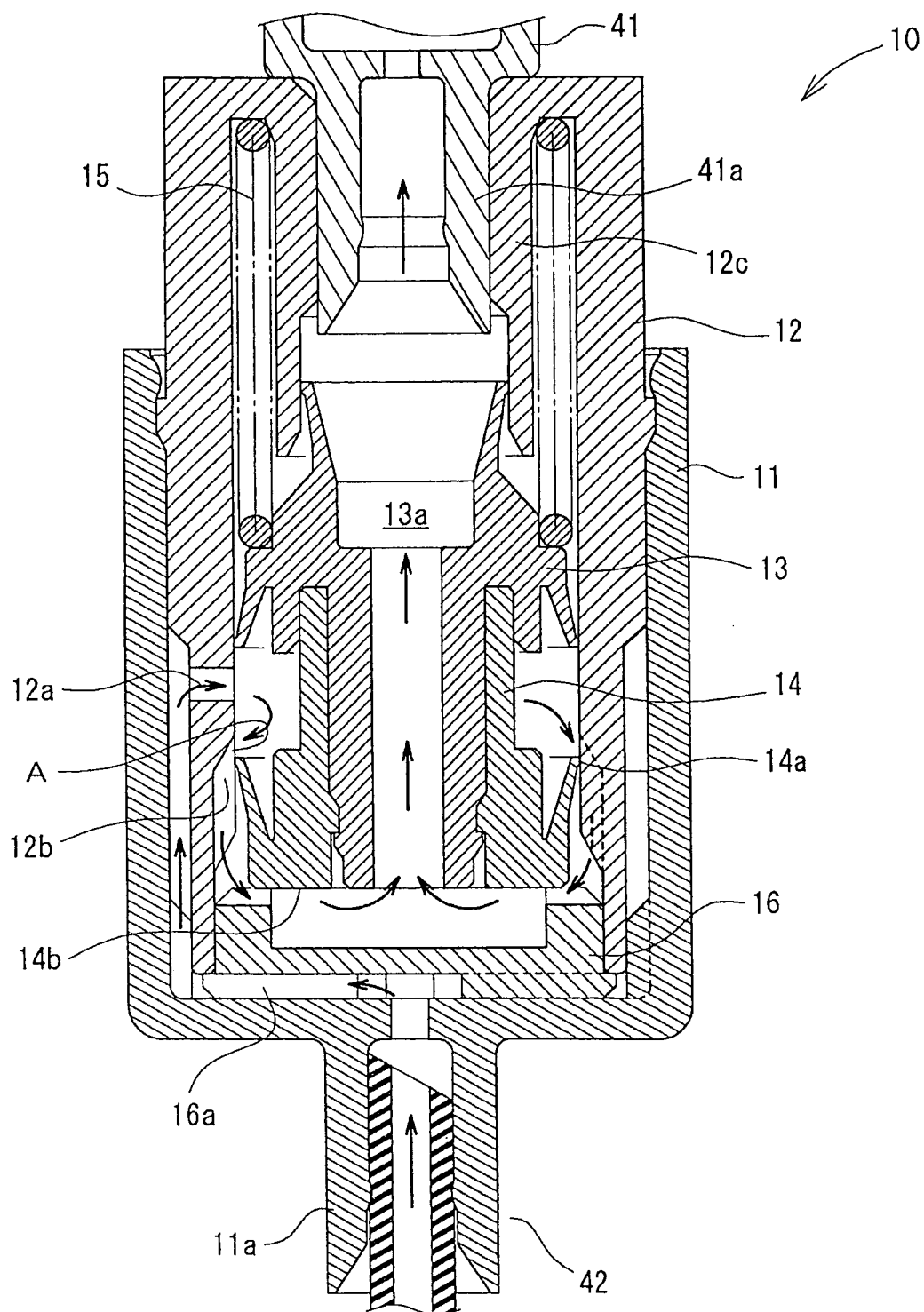


FIGURE 3

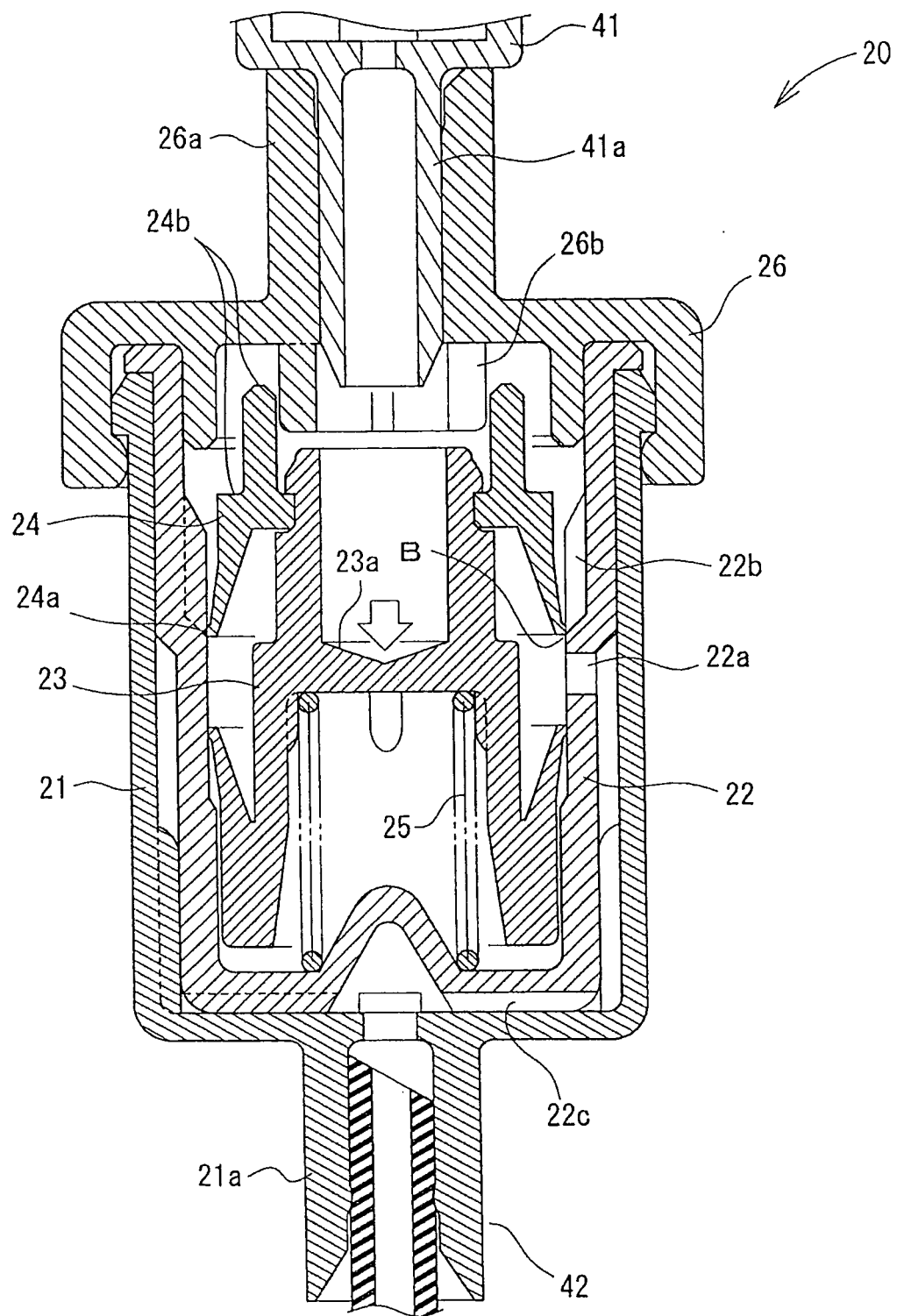


FIGURE 4

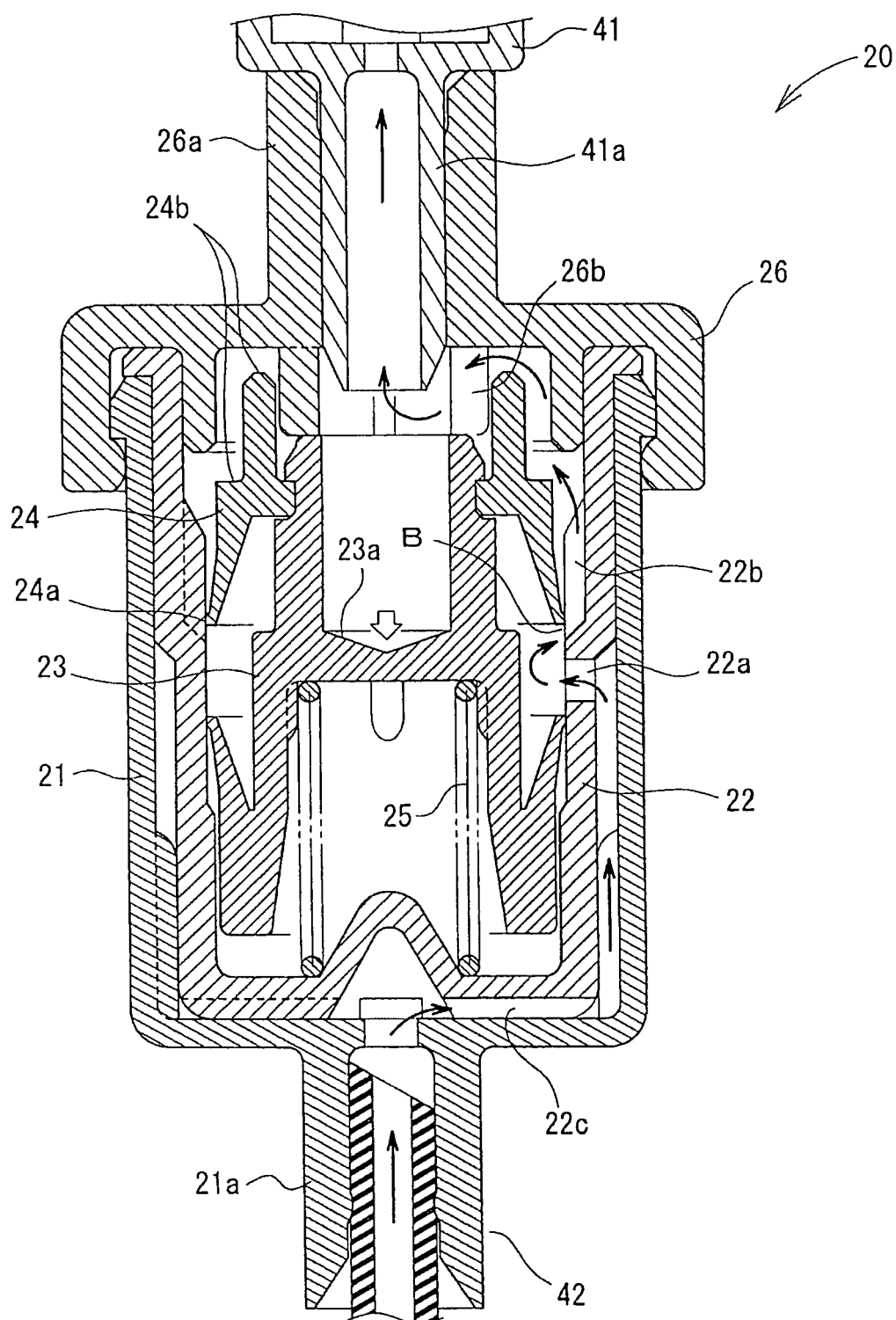


FIGURE 5

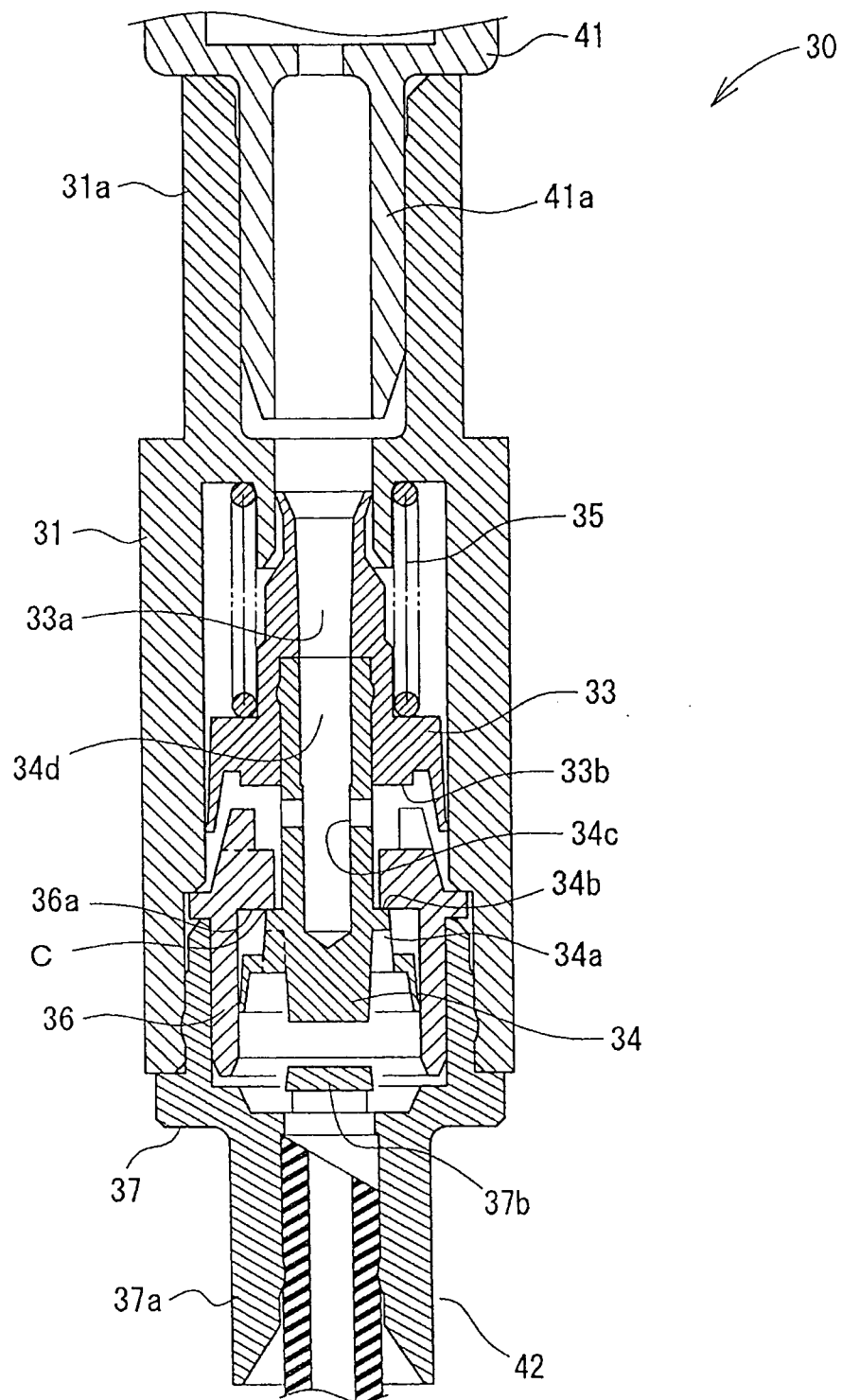


FIGURE 6

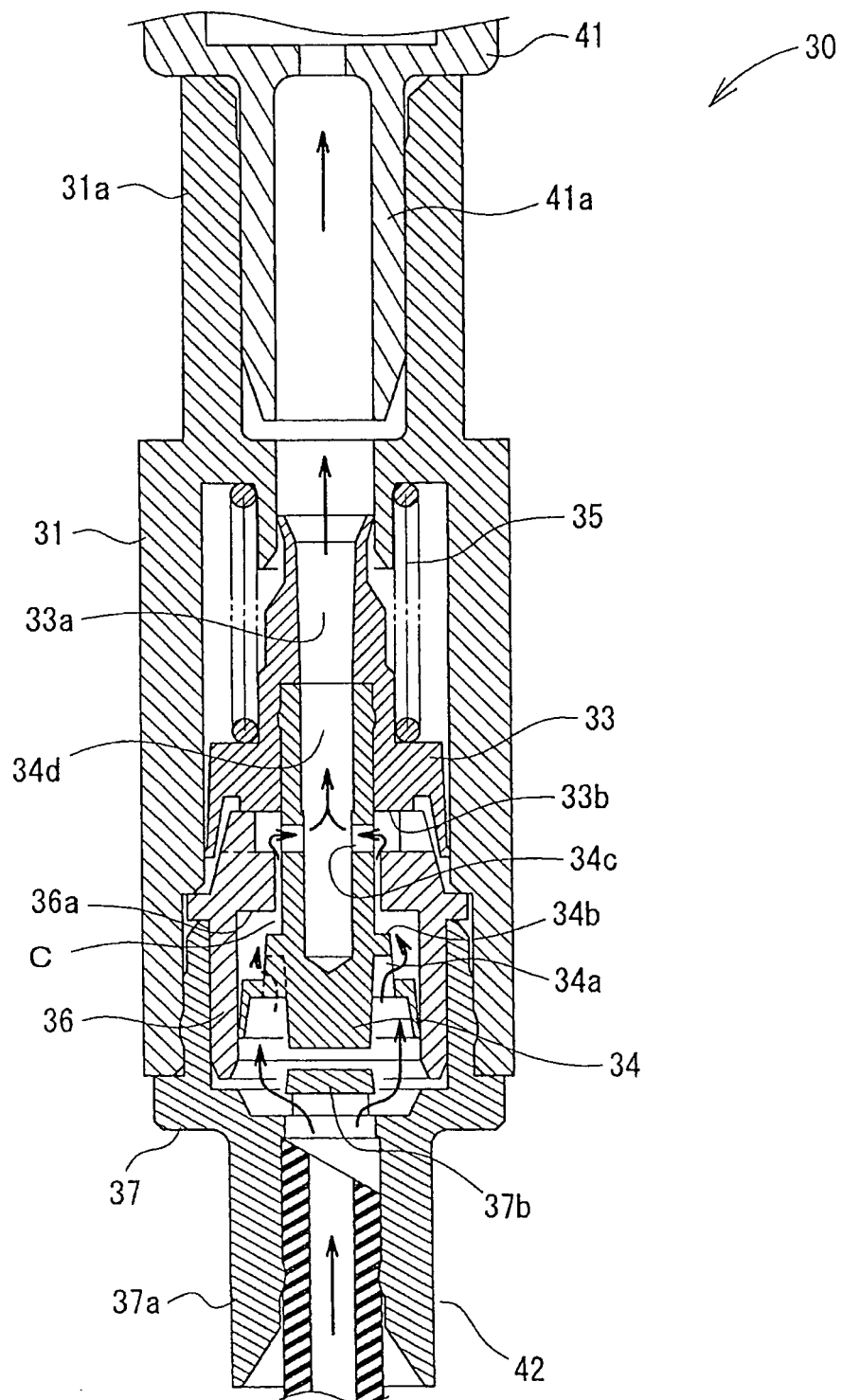


FIGURE 7

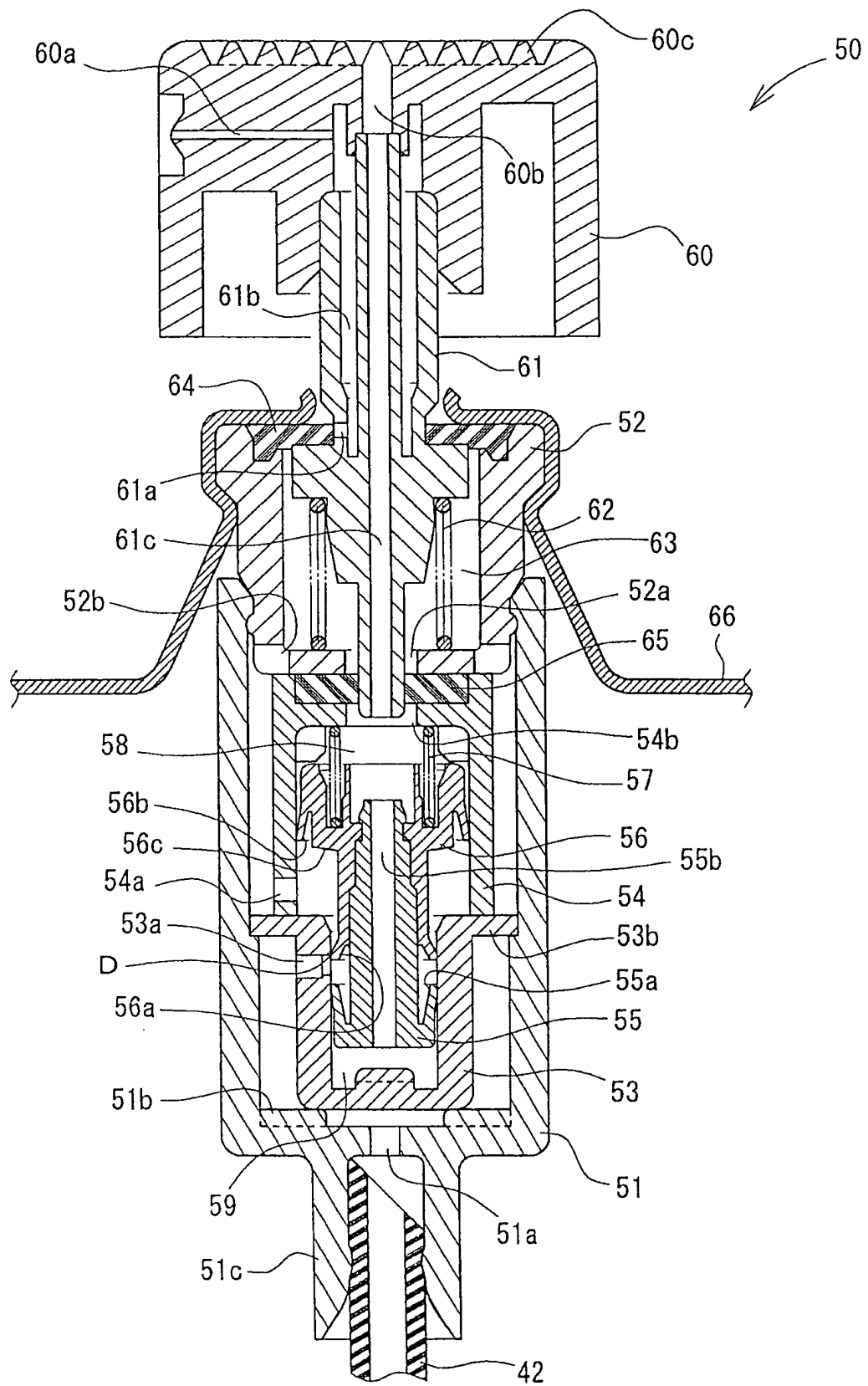
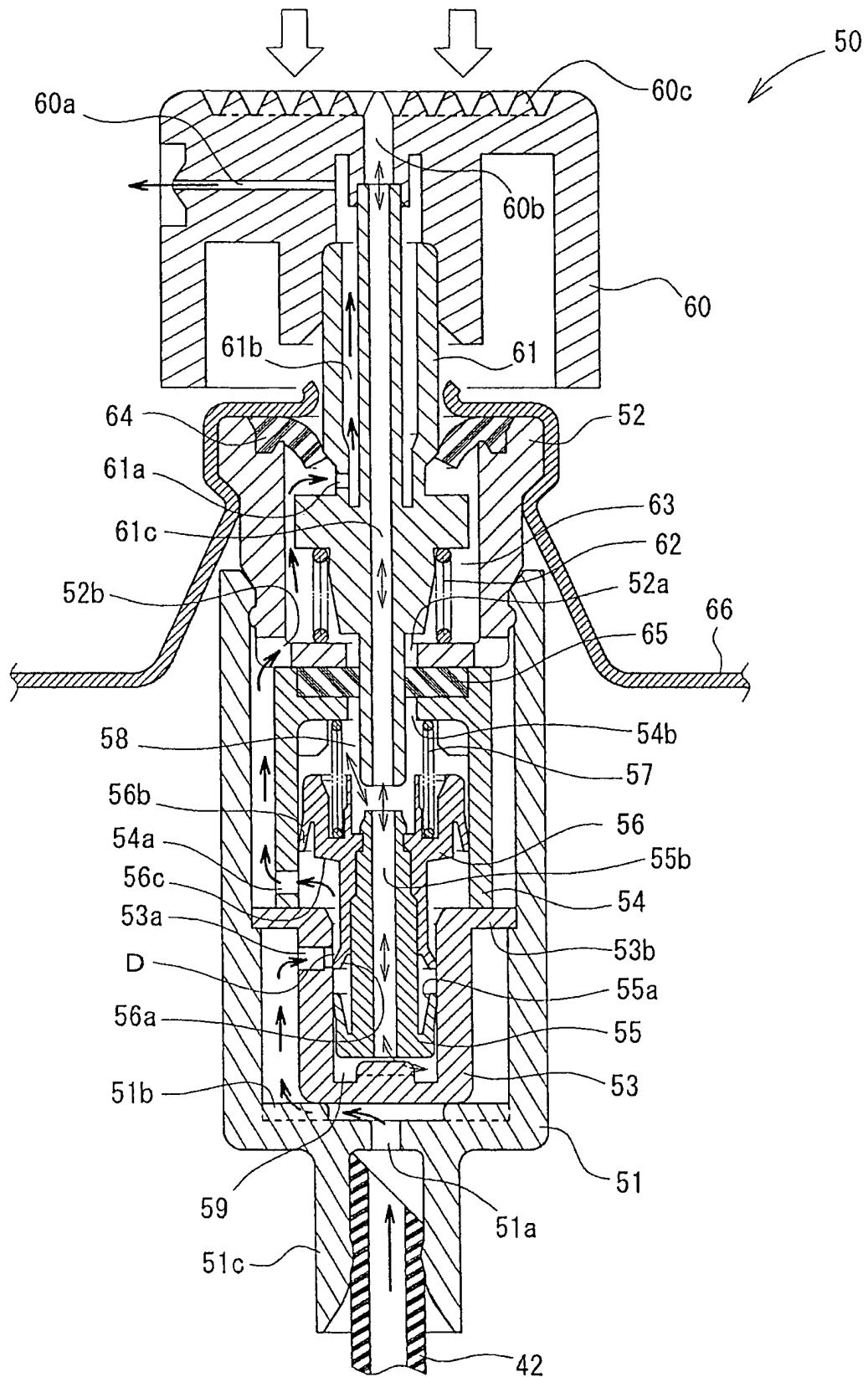


FIGURE 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/018348

A. CLASSIFICATION OF SUBJECT MATTER

B65D83/44 (2006.01), **B05B9/04** (2006.01)

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)

B05B9/04, B65D83/44

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2006
Kokai Jitsuyo Shinan Koho	1971-2006	Toroku Jitsuyo Shinan Koho	1994-2006

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	JP 8-108112 A (Mitani Valve Co., Ltd.), 30 April, 1996 (30.04.96), Full text; all drawings (Family: none)	1-5
A	JP 2002-347863 A (Mitani Valve Co., Ltd.), 04 December, 2002 (04.12.02), Full text; all drawings (Family: none)	1-5
A	JP 2004-42980 A (Mitani Valve Co., Ltd.), 12 February, 2004 (12.02.04), Full text; all drawings (Family: none)	1-5

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

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"&" document member of the same patent family

Date of the actual completion of the international search
06 January, 2006 (06.01.06)Date of mailing of the international search report
17 January, 2006 (17.01.06)Name and mailing address of the ISA/
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REFERENCES CITED IN THE DESCRIPTION

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