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(54) POWER RESTRICTING DEVICE FOR IMITATION GUN

(57) Even in a case of using a bullet whose mass is higher than that of a plastic BB bullet, kinetic energy of the shot bullet is controlled so as not to exceed a stipulated value.

In a simulated gun which shoots a bullet 15 by loading the bullet 15 on an airflow jet route and using a compressed airflow, as means for controlling power for shooting the bullet 15 in accordance with mass of the bullet 15, an airflow leakage portion 20 through which the compressed airflow leaks is formed in the jet route or a portion leading to the jet route.

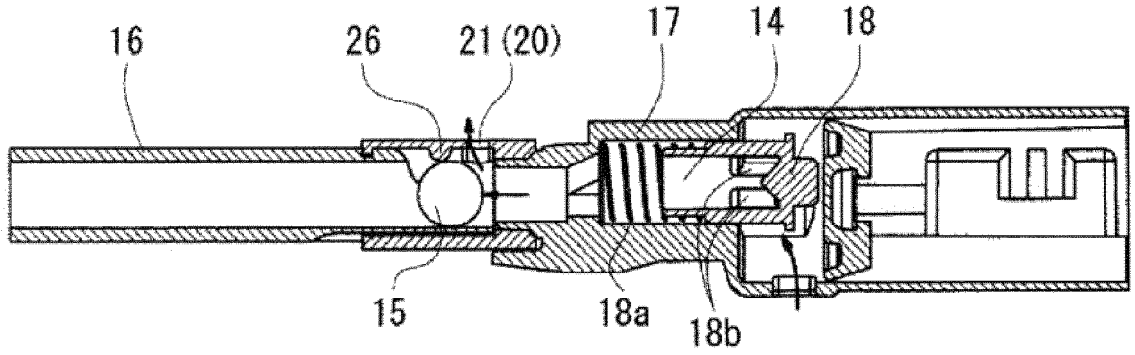

Fig. 2

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Description

Technical Field

[0001] The present invention relates to a device for controlling shooting power in a simulated gun which shoots a bullet by loading the bullet on an airflow jet route and using a compressed airflow.

Background Art

[0002] With regard to a simulated gun such as an air gun or a gas gun, Article 1-2 of Firearms and Swords Possession Control Law stipulates kinetic energy of a shot bullet. According to this law, in a case of using a bullet of 6 mm in diameter, it is understood that the simulated gun has to be handled as a semi-air gun if energy at a specified measurement point exceeds 3.5 J/cm^2. Therefore, the gas gun exceeding the above-described stipulated value has not been manufactured. However, in a case where several conditions overlap each other, it is considered that the gas gun may temporarily exceed the stipulated value. For example, there is a possibility that using the gas gun under high temperature in summer may cause the above-described problem.

[0003] Apart from a temperature condition, when a manufacturer's unintended bullet is used, the bullet may be a problem as well. In this type of the simulated gun, the bullet of 6 mm in diameter is used as described above, and is called a BB bullet. As the BB bullet, each manufacturer sells a plastic molded product. However, an example is reported in which a metal ball of 6 mm in diameter such as a ball bearing is improperly used. Therefore, if a condition of using a heavy bullet other than a generally used plastic BB bullet, a condition of using the simulated gun under high temperature in summer, and a condition of using a highly powerful power source (CO_2) other than generally used gas of 134a are combined with each other, a phenomenon may occur in which bullet speed unpredictably increases.

[0004] If a metal ball bearing whose mass is higher than that of the plastic BB bullet is used as the bullet in this way, each manufacturer cannot overlook the situation. Unless some countermeasures are taken, there is a possibility that illegal acts may be unexpectedly overlooked. As for the simulated gun industry, this possibility is undesirable. However, since the situation has not been expected, a technique for distinguishing or rejecting a metal bullet is not known yet.

[0005] If the related art is investigated, JP-A-2009-14327 discloses an invention relating to an air gun. The disclosed invention has the following configuration. An automatic valve is disposed inside a gas release flow path. If pressure and a flow rate of compressed gas released from a gas accumulator to an inner barrel reach a fixed value or greater, the automatic valve automatically narrows and closes a flow path installed from the inside of the gas release flow path to the inner barrel, thereby regulating the pressure and the flow rate of the compressed gas released from the gas accumulator to the inner barrel. However, a member such as the automatic valve has to be additionally provided, thereby resulting in a complicated configuration. In addition, the automatic valve has to close a gas release port before the bullet is shot. In this regard, a question on whether the invention can be put to practical use still remains.

Citation List

Patent Literature

[0006] [PTL 1] JP-A-2009-14327

Summary of Invention

Technical Problem

[0007] The present invention is made in view of the above-described viewpoints, and an object thereof is to particularly provide a power control device in a simulated gun which has the simplest configuration in which kinetic energy of a shot bullet does not exceed a stipulated value even in a case of using a bullet whose mass is higher than that of a plastic BB bullet. In addition, another object of the present invention is to provide the power control device in the simulated gun which is compatible without practically decreasing the kinetic energy generated by the BB bullet in a case where the plastic BB bullet is used while being mixed with the bullet whose mass is higher than that of the plastic BB bullet.

Solution to Problem

[0008] In order to solve the problem, the present invention provides a simulated gun which shoots a bullet by loading the bullet on an airflow jet route and using a compressed airflow. As means for controlling power for shooting the bullet in accordance with mass of the bullet, an airflow leakage portion through which the compressed airflow leaks is formed in the jet route or a portion leading to the jet route. The simulated gun to which the present invention is applicable uses the compressed airflow, and is mainly represented by an air gun using air and a so-called gas gun using gas other than the air. Therefore, in the present invention, a flow of compressed air and a flow of the gas other than the compressed air are collectively referred to as the compressed airflow.

[0009] In a configuration of the simulated gun, a device according to the present invention has the airflow leakage portion through which the compressed airflow leaks. The compressed airflow is jetted using the same pressurizing force applied to both a BB bullet and a metal bullet. However, in accordance with the Newton's equation of motion, acceleration acting on the bullet is in proportion to an action force, and is in inverse proportion to mass of the bullet.

[0010] That is, a lighter bullet (having low mass) starts to move using weaker kinetic energy. In contrast, a heavier bullet (having high mass) cannot start to move without using stronger kinetic energy. In other words, a lighter BB bullet is shot by shortening an airflow leakage time. In contrast, the airflow leakage time is lengthened before a heavier metal bullet is shot. On the other hand, the amount of the compressed airflow used in shooting a single bullet is constant, and power is controlled as much as a leakage.

[0011] In the device according to the present invention, a preferable aspect is that the airflow leakage portion is configured to include a normally open small hole or clearance which is formed in the jet route through which the compressed airflow can pass or a portion directly leading to the jet route. If the airflow leakage portion is normally open, a configuration is further simplified. In addition, compared to a method which does not allow an airflow leakage, a time difference before shooting the bullet is further reduced and settled.

[0012] A preferable aspect of the present invention is a configuration in which the airflow leakage portion is located upstream from a position on the jet route where the bullet is loaded, and functions as a normally open flow path through which the compressed airflow can pass. However, a configuration may also be adopted in which the airflow leakage portion is formed in a portion from upstream to downstream of a position on the jet route where the bullet is loaded.

Advantageous Effects of Invention

[0013] The present invention is configured as described above so as to have an operation effect. Even in a case of using the metal bullet whose mass is higher than that of the plastic BB bullet, power is controlled so that kinetic energy of the shot bullet does not exceed a stipulated value. Accordingly, an advantageous effect is obtained in that this control can be achieved by adopting the simplest configuration of the normally open flow path. In addition, according to the present invention, it is possible to provide the power control device in the simulated gun which is compatible without practically reducing the kinetic energy in a case where the plastic BB bullet is used while being mixed with the metal bullet whose mass is higher than that of the plastic BB bullet.

Description of Embodiments

[0014] Hereinafter, the present invention will be described in more detail with reference to the illustrated embodiment. Fig. 1 illustrates a simulated gun 10 to which a power control device according to the present invention is applied. The simulated gun 10 includes an air gun using compressed air and a gas gun using gas other than the air. Examples illustrated in Figs. 1 to 6 represent a case of the gas gun.

[0015] The gas gun uses compressed gas as a compressed airflow. Although a schematic configuration thereof will be described, a specific configuration may be the same as a known configuration. A gas source 11 is filled with the compressed gas. The compressed gas is released to a jet route 14 from a release valve 13 which controls gas release in response to an operation of a trigger 12, and is jetted to a bullet 15 loaded on a bullet cartridge in the rear of a barrel 16. The jet route 14 through which the released compressed gas flows is provided with a slide cylinder 17. A configuration is adopted in which the bullet 15 supplied from a magazine 19 is loaded on the bullet cartridge by sliding the slide cylinder 17 in a longitudinal direction.

[0016] Although a valve device 18 does not directly relate to the power control device according to the present invention, the valve device 18 disposed inside the slide cylinder 17 will be described. The valve device 18 temporarily closes the compressed airflow flowing out to the barrel side after the bullet is shot, and stores the compressed airflow inside the cylinder. The valve device 18 causes a piston 27 located in the rear and a slide formed integrally with the piston 27 to retreat, thereby causing simulated blowback. The valve device 18 adopts a configuration in which a gas flow is biased in an upstream direction by a coil spring of biasing means 18a disposed inside the valve device 18 so that an area of a side surface opening 18b is changed by the slide.

[0017] In the power control device according to the present invention, an airflow leakage portion 20 is located upstream from a position on the jet route on which the bullet 15 is loaded, and is configured to function as a normally open flow path through which the compressed airflow can pass. The position on the jet route on which the bullet 15 is loaded indicates the bullet cartridge in the rear of the barrel 16. An embodiment of the power control device applied to this gas gun will be described with reference to Figs. 2 to 6. An arrow in each drawing schematically indicates a flowing direction of the compressed airflow in each example.

[0018] In Example 1 of a gas gun power control device illustrated in Fig. 2, the airflow leakage portion 20 is configured to function as a small hole 21 serving as a normally open flow path that is open in a barrel rear end portion which is a portion of the jet route 14 through which the compressed airflow can pass. In each example of the embodiment, a hop-up device 26 is disposed in the bullet cartridge. Therefore, as a structure penetrating both the barrel 16 and a tubular member of the hop-up device 26, the small hole 21 allows the compressed airflow to leak out from the jet route 14.

[0019] In Example 2 of the gas gun power control device illustrated in Fig. 3, the airflow leakage portion 20 is configured so as to generate a clearance 22 around the bullet 15 in such a way that a caliber of the barrel 16 which is a portion of the jet route 14 through which the compressed airflow can pass is increased one size larger than a diameter of the bullet 15. Since the airflow leakage portion 20 has the clearance 22, the airflow leakage por-

tion 20 functions as the normally open flow path. In a case of Example 2, the hop-up device 26 disposed in the bullet cartridge is formed to be slightly long. The clearance 22 in Example 2 allows the compressed airflow to leak around the bullet 15.

[0020] In Example 3 of the gas gun power control device illustrated in Fig. 4, the airflow leakage portion 20 is configured to function as a small hole 23 serving as the normally open flow path that is open in a nozzle 17a of the slide cylinder 17 which is a portion of the jet route 14 through which the compressed airflow can pass. In a case of Example 3, as a structure penetrating the slide cylinder nozzle 17a, the small hole 23 is disposed at a rear position from the bullet cartridge. The airflow leakage portion 20 has the simplest structure for allowing the compressed airflow to leak out from the jet route 14.

[0021] In Example 4 of the gas gun power control device illustrated in Fig. 5, the airflow leakage portion 20 is configured to function as a small hole 24 serving as the normally open flow path that is disposed in a main body of the slide cylinder 17 as a portion of the jet route 14 through which the compressed airflow can pass. In a case of Example 4, as a structure penetrating the slide cylinder nozzle 17a, the small hole 24 is disposed at a position which is rear from the bullet cartridge and front from the piston 27. Accordingly, the airflow leakage portion 20 also has a simple structure for allowing the compressed airflow to leak out from the jet route 14.

[0022] In Example 5 of the gas gun power control device illustrated in Fig. 6, the airflow leakage portion 20 is configured to function as a clearance 25 disposed between the barrel rear end portion serving as a portion of the jet route 14 through which the compressed airflow can pass and the slide cylinder nozzle 17a. Since the airflow leakage portion 20 also has the clearance 25, the airflow leakage portion 20 functions as the normally open flow path. The clearance 25 in Example 5 can be set by adjusting a forward moving position of the slide cylinder 17.

[0023] Furthermore, an example applied to an air gun using compressed air as the power control device according to the present invention will be described. Fig. 7 illustrates a basic configuration of the air gun. Instead of the gas source of the gas gun, the air gun is provided with a piston cylinder device 30 for compressing the air. The piston cylinder device 30 includes a piston 28 and a cylinder 29, and converts the compressed air into the compressed airflow by the operation of the piston 28. A cocking mode of the piston 28 can be selected manually or electrically.

[0024] Even in a case where the power control device according to the present invention is applied to the above-described air gun, the same reference numerals will be given to the barrel 16 and the hop-up device 26 which are provided in common, and detailed description thereof will be omitted. Hereinafter, an embodiment of the power control device applied to the air gun will be further described with reference to Figs. 8 to 13.

[0025] In Example 1 of an air gun power control device illustrated in Fig. 8, the airflow leakage portion 20 is configured to function as a small hole 31 serving as the normally open flow path that is open in the barrel rear end portion which is a portion of the jet route 14 through which the compressed airflow can pass. Similarly to a case of Example 1 of the gas gun power control device, the hop-up device 26 is disposed in the bullet cartridge. Therefore, as a structure penetrating both the barrel 16 and the tubular member of the hop-up device 26, the small hole 31 allows the compressed airflow to leak out from the jet route 14. Example 1 of the air gun corresponds to Example 1 (refer to Fig. 2) of the gas gun.

[0026] In Example 2 of the air gun power control device illustrated in Fig. 9, the airflow leakage portion 20 is configured to function as a clearance 32 in such a way that the caliber of the barrel 16 which is a portion of the jet route 14 through which the compressed airflow can pass is increased one size larger than the diameter of the bullet 15. Since the airflow leakage portion 20 has the clearance 32, the airflow leakage portion 20 functions as the normally open flow path. In a case of Example 2, the hop-up device 26 disposed in the bullet cartridge is formed to be slightly long. The clearance 32 in Example 2 allows the compressed airflow to leak around the bullet 15. Example 2 of the air gun corresponds to Example 2 (refer to Fig. 3) of the gas gun.

[0027] In Example 3 of the air gun power control device illustrated in Fig. 10, the airflow leakage portion 20 is configured to function as a small hole 33 serving as the normally open flow path that is open in a nozzle 29a of an air gun cylinder 29 as a portion of the jet route 14 through which the compressed airflow can pass. In a case of Example 3, as a structure penetrating the slide cylinder nozzle 29a, the small hole 33 may be disposed at a rear position from the bullet cartridge. Accordingly, the airflow leakage portion 20 has the simplest structure for allowing the compressed airflow to leak out from the jet route 14. Example 3 of the air gun corresponds to Example 3 (refer to Fig. 4) of the gas gun.

[0028] In Example 4 of the air gun power control device illustrated in Fig. 11, the airflow leakage portion 20 is configured to function as a small hole 34 serving as the normally open flow path that is disposed in a main body of the slide cylinder 29 as a portion of the jet route 14 through which the compressed airflow can pass. In a case of Example 4, as a structure penetrating the slide cylinder nozzle 29a, the small hole 34 is disposed at a rear position from the bullet cartridge and at a front position from a forward moving limit of the piston 28. Accordingly, the airflow leakage portion 20 also has a simple structure for allowing the compressed airflow to leak out from the jet route 14. Example 4 of the air gun corresponds to Example 4 (refer to Fig. 5) of the gas gun.

[0029] In Example 5 of the air gun power control device illustrated in Fig. 12, the airflow leakage portion 20 is configured to function as a clearance 35 disposed between the barrel rear end portion which is a portion of

the jet route 14 through which the compressed airflow can pass and the slide cylinder nozzle 29a. Since the airflow leakage portion 20 has the clearance 35, the airflow leakage portion 20 also functions as the normally open flow path. The clearance 35 in Example 5 can be set by adjusting the forward moving position of the slide cylinder 17. Example 5 of the air gun corresponds to Example 5 (refer to Fig. 6) of the gas gun.

[0030] In Example 6 of the air gun power control device illustrated in Fig. 13, the airflow leakage portion 20 is configured to function as a clearance 36 in such a way that an outer peripheral diameter of the piston 28 is decreased one size smaller than an inner peripheral surface of the air gun cylinder 29, which is a portion of the jet route 14 through which the compressed airflow can pass. Since the airflow leakage portion 20 has the clearance 36, the airflow leakage portion 20 also functions as the normally open flow path. In a case of Example 6, air compression capacity is intentionally degraded.

[0031] In Example 7 of the air gun power control device illustrated in Fig. 14, the airflow leakage portion 20 is configured in such a way that a small hole 37 penetrating the piston 28 is disposed in the piston 28 sliding on the inner peripheral surface of the air gun cylinder 29, which is a portion of the jet route 14 through which the compressed airflow can pass. Since the airflow leakage portion 20 has the small hole 37, the airflow leakage portion 20 also functions as the normally open flow path. A case of Example 7 is the same as that of Example 5 in that the air compression capacity is intentionally degraded.

[0032] According to the present invention configured in this way, even in a case of using the metal bullet whose mass is higher than that of the plastic BB bullet, power can be controlled so that the kinetic energy of the shot bullet does not exceed the stipulated value. There is no danger of causing a possibility that unexpected power may be harmful to safety. Moreover, even in a case where the plastic BB bullet is used while being mixed with the metal bullet whose mass is higher than that of the plastic BB bullet, the power control device is compatibly used without practically decreasing the power of the BB bullet. Accordingly, the simulated gun according to the present invention can be treated as a simulated gun having substantially the same power as the power in the related art. Therefore, there is no possibility that users may be dissatisfied with the simulated gun according to the present invention.

Brief Description of Drawings

[0033]

Fig. 1 is a sectional explanatory view illustrating an internal structure of a gas gun as an example of a power control device in a simulated gun according to the present invention.
Fig. 2 is a sectional explanatory view illustrating Example 1 in which the device is applied to the gas gun.
Fig. 3 is a sectional explanatory view illustrating Example 2 of the gas gun.
Fig. 4 is a sectional explanatory view illustrating Example 3 of the gas gun.
Fig. 5 is a sectional explanatory view illustrating Example 4 of the gas gun.
Fig. 6 is a sectional explanatory view illustrating Example 5 of the gas gun.
Fig. 7 is a sectional explanatory view illustrating a main part of an air gun structure as another example of the power control device in the simulated gun according to the present invention.
Fig. 8 is a sectional explanatory view illustrating Example 1 in which the device is applied to the air gun.
Fig. 9 is a sectional explanatory view illustrating Example 2 of the air gun.
Fig. 10 is a sectional explanatory view illustrating Example 3 of the air gun.
Fig. 11 is a sectional explanatory view illustrating Example 4 of the air gun.
Fig. 12 is a sectional explanatory view illustrating Example 5 of the air gun.
Fig. 13 is a sectional explanatory view illustrating Example 6 of the air gun.
Fig. 14 is a sectional explanatory view illustrating Example 7 of the air gun.

Reference Signs List

[0034]

10	SIMULATED GUN
11	GAS SOURCE
12	TRIGGER
13	RELEASE VALVE
14	JET ROUTE
15	BULLET
16	BARREL
17	SLIDE CYLINDER
18	VALVE DEVICE
19	MAGAZINE
20	AIRFLOW LEAKAGE PORTION
21, 23, 24	SMALL HOLE
22, 25	CLEARANCE
26	HOP-UP DEVICE
27	GAS GUN PISTON
28	AIR GUN PISTON
29	AIR GUN CYLINDER
30	PISTON CYLINDER DEVICE
31, 33, 34, 37	SMALL HOLE
32, 35, 36	CLEARANCE

Claims

1. A power control device in a simulated gun which shoots a bullet by loading the bullet on an airflow jet route and using a compressed airflow,

wherein as means for controlling power for shooting the bullet in accordance with mass of the bullet, an airflow leakage portion through which a compressed airflow leaks is formed in the jet route or a portion leading to the jet route.

2. The power control device in a simulated gun according to Claim 1,
wherein the airflow leakage portion is located upstream from a position on the jet route where the bullet is loaded, and functions as a normally open flow path through which the compressed airflow can pass.

3. The power control device in a simulated gun according to Claim 1 or 2,
wherein the airflow leakage portion is configured to include a normally open small hole or clearance which is formed in the jet route through which the compressed airflow can pass or a portion directly leading to the jet route.

4. The power control device in a simulated gun according to Claim 1,
wherein the airflow leakage portion is formed in a portion from upstream to downstream of a position on the jet route where the bullet is loaded.

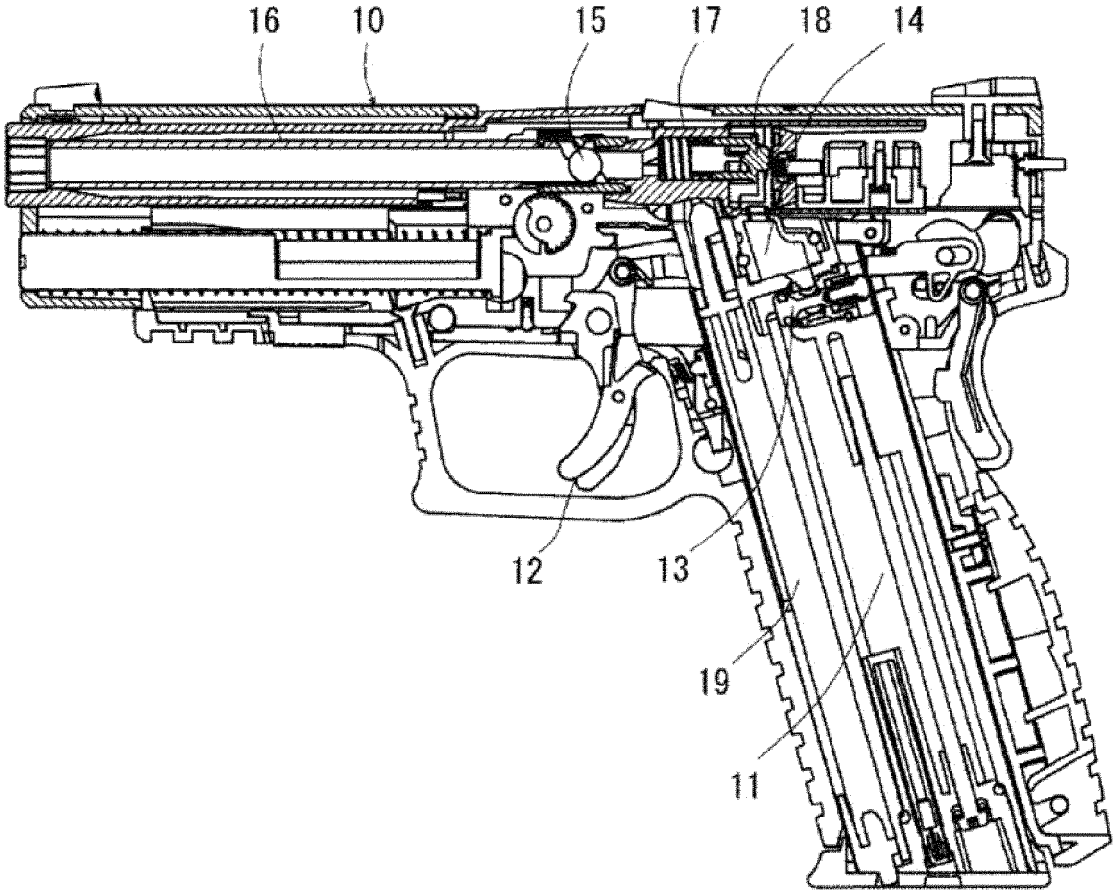

Fig. 1

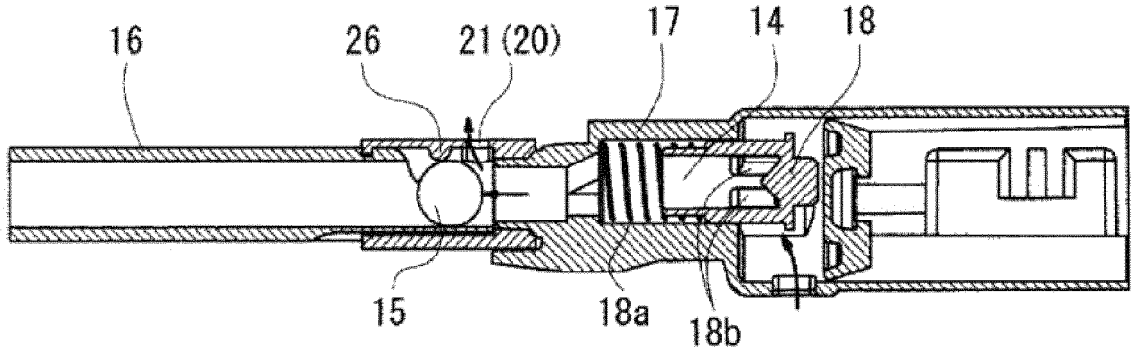

Fig. 2

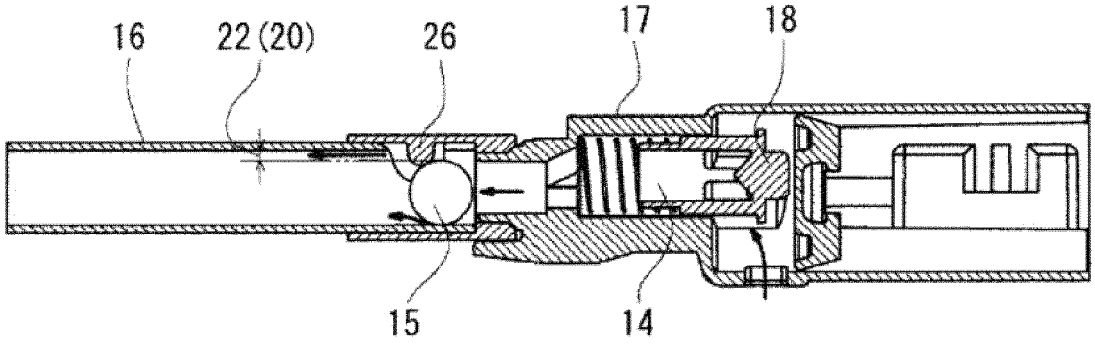

Fig. 3

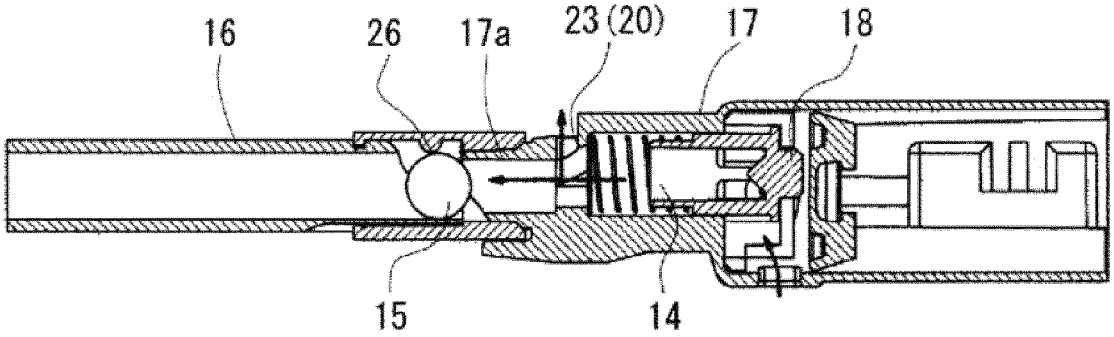

Fig. 4

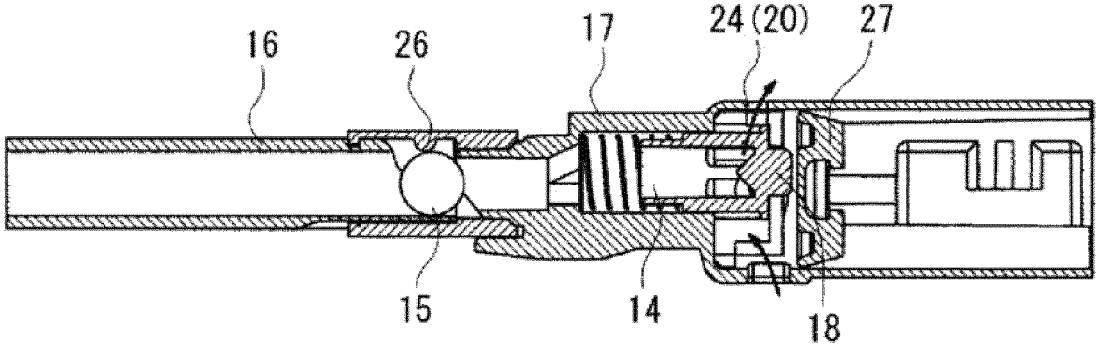

Fig. 5

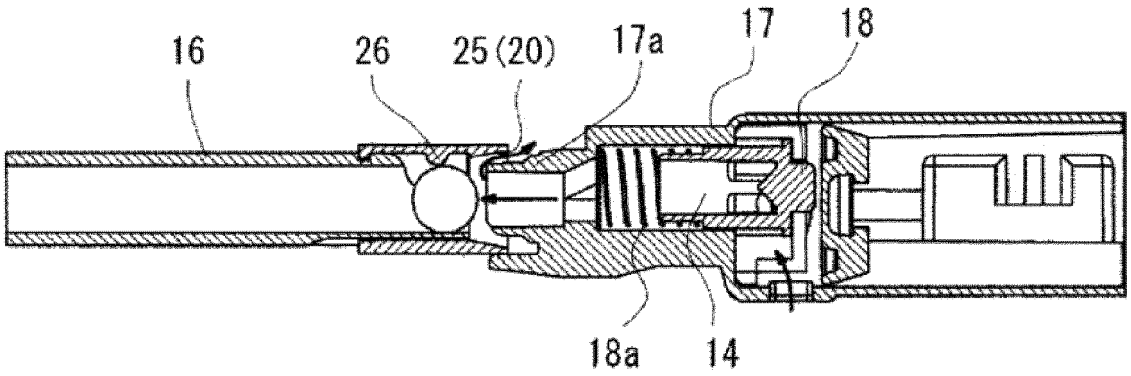

Fig. 6

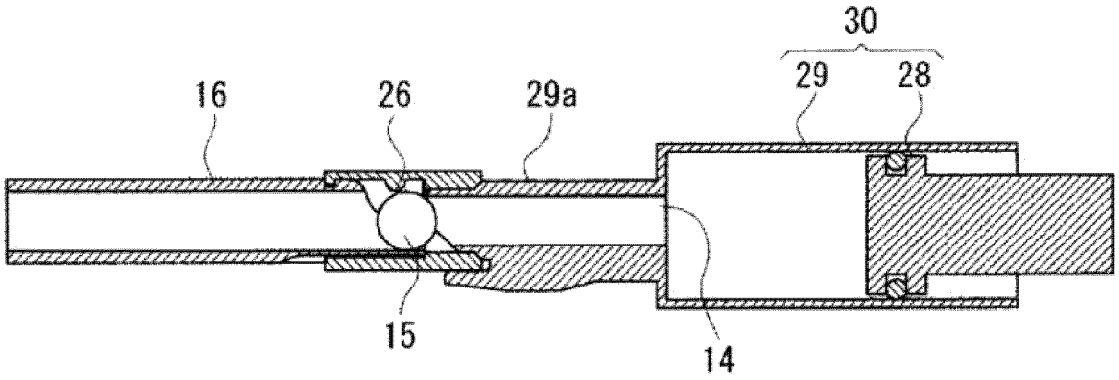

Fig. 7

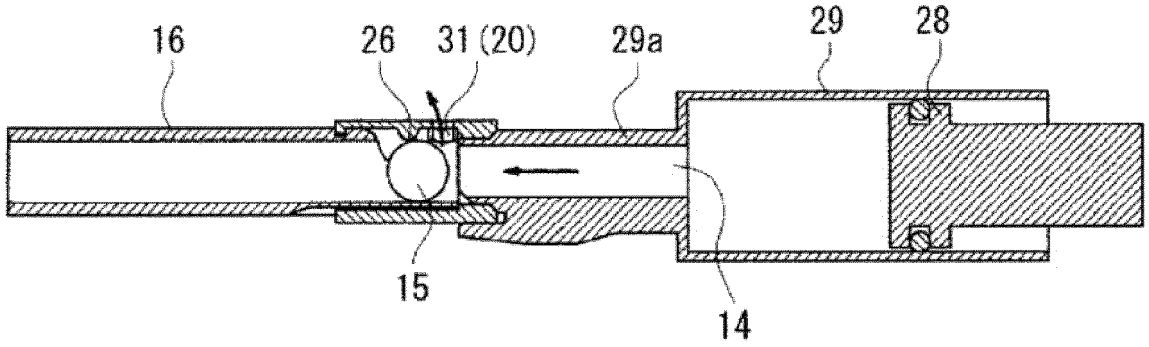

Fig. 8

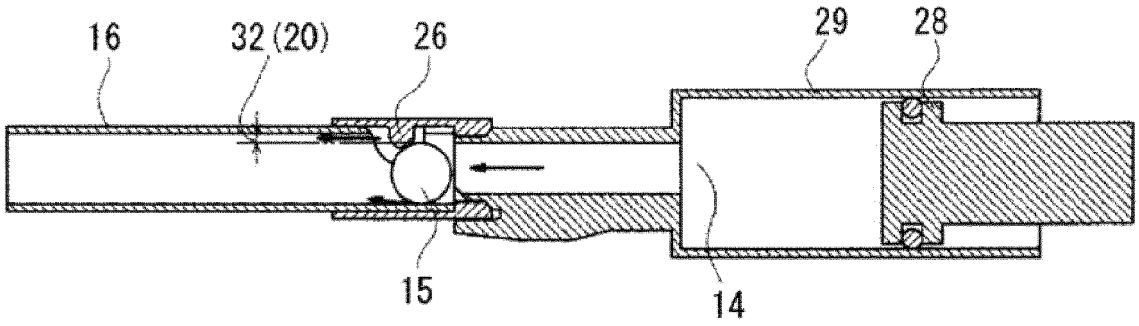

Fig. 9

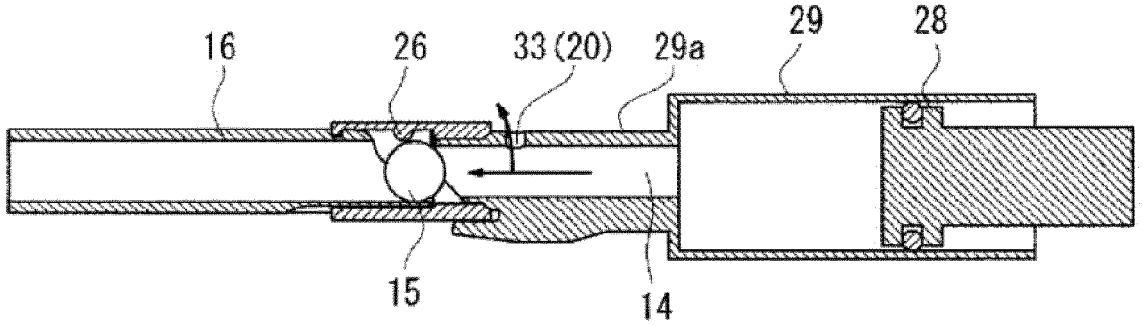

Fig. 10

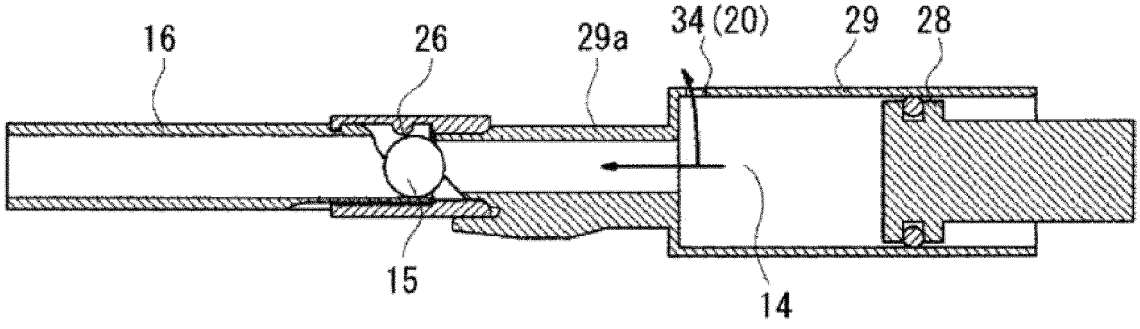

Fig. 11

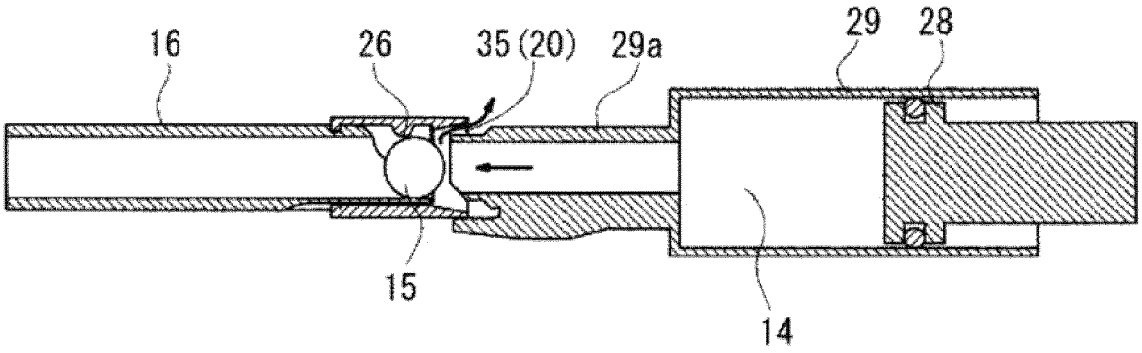

Fig. 12

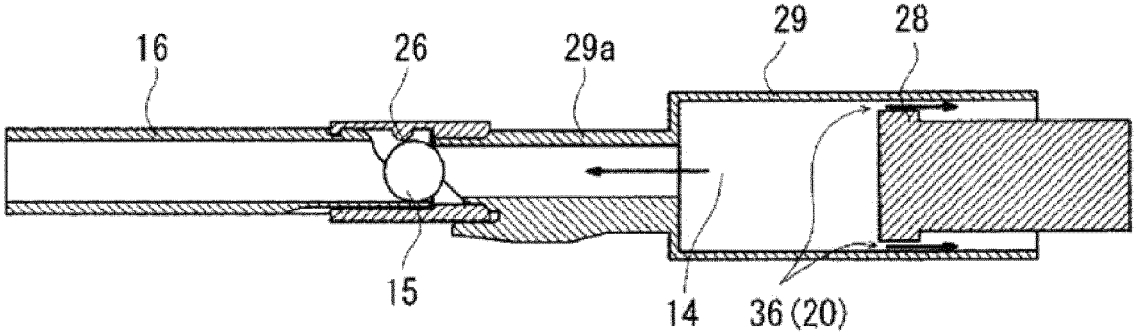

Fig. 13

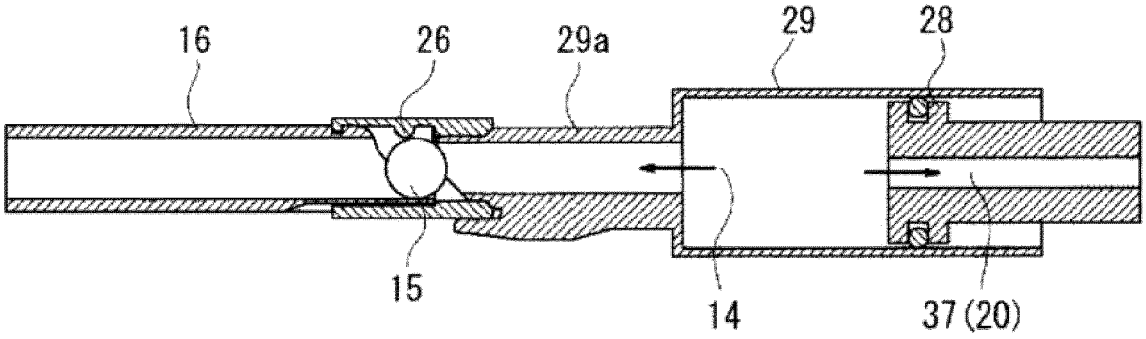

Fig. 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2014/066674

A. CLASSIFICATION OF SUBJECT MATTER
F41B11/60(2013.01)i, *F41B11/56*(2013.01)i, *F41B11/62*(2013.01)i, *F41B11/643*(2013.01)i, *F41B11/70*(2013.01)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)
F41B11/60, F41B11/56, F41B11/62, F41B11/643, F41B11/70

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 1996-2014
Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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.
X	JP 2006-284139 A (Kabushiki Kaisha Sunamiya), 19 October 2006 (19.10.2006), claim 4; fig. 1 (Family: none)	1-4
X	JP 2008-39371 A (Marushin Kogyo Kabushiki Kaisha), 21 February 2008 (21.02.2008), claims 3, 4; fig. 3 (Family: none)	1,3
X	JP 7-103694 A (Western Arms Corp.), 18 April 1995 (18.04.1995), paragraph [0028] & US 5476087 A & EP 647825 A1	1

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

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
18 August, 2014 (18.08.14)	26 August, 2014 (26.08.14)
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Patent documents cited in the description

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