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(54) **Toy rifle backlash vibration structure**

(57) A toy rifle (air soft rifle, BB-rifle) backlash vibration structure (a) which has a weight (3) directly stopped against the rear side of a piston spring (11) at the rear side of the piston (1) of the toy rifle to avoid piston damage while providing a backlash vibration to simulate a reaction

force upon firing of a bullet, and a buttcap spacer (5) detachably fastened to the rear side of a receiver extension (2) and mounted with an adjustment rod (6) that is rotatable forwards/backwards to adjust the backlash vibration within a predetermined range from zero to the maximum.

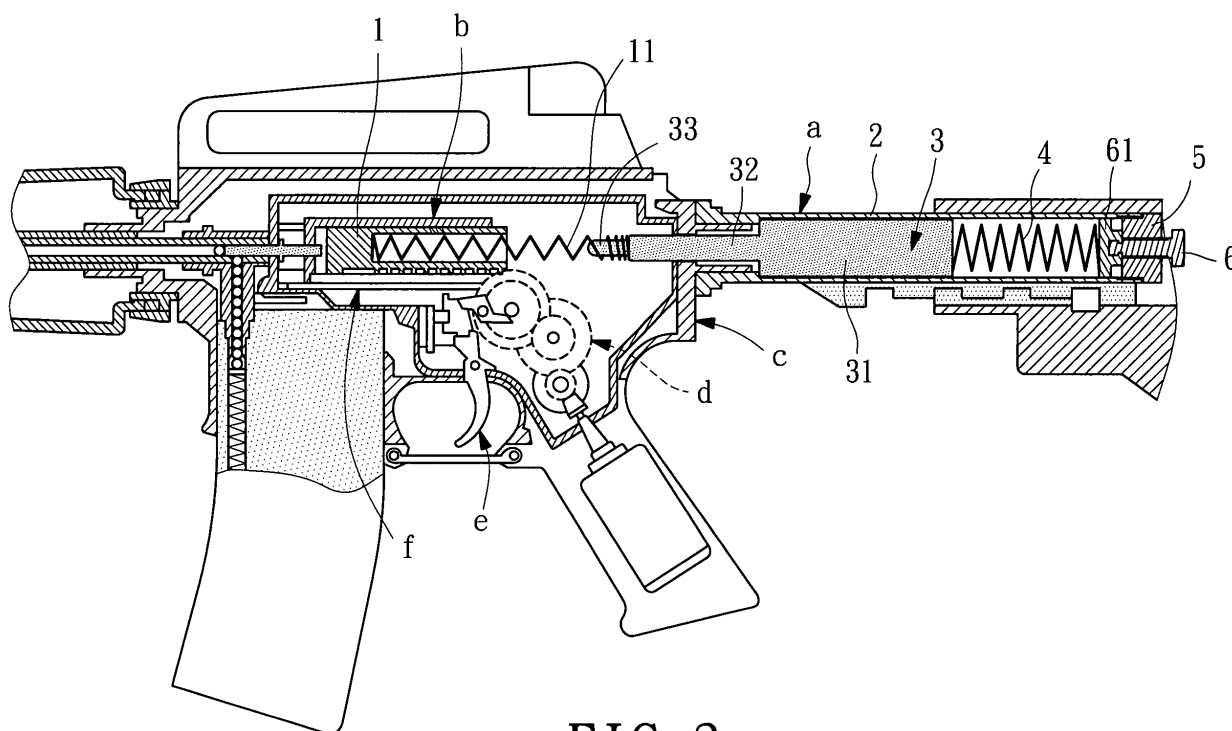


FIG. 3

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a toy rifle (air soft rifle/BB-rifle) and more particularly, to a toy rifle backlash vibration structure that allows adjustment of the backlash vibration within a predetermined range from zero to the maximum.

2. Description of the Related Art

[0002] To simulation of a real automatic rifle, a toy rifle (air soft rifle/BB-rifle) may be provided with a backlash vibration structure. Taiwan Patent Publication No.200708712 discloses a similar design. However, this design is still not satisfactory in function.

[0003] FIG. 1 illustrates a backlash vibration structure (a') installed in a toy rifle. As illustrated, the backlash vibration structure (a') is arranged at the rear side in axial alignment with the piston (10) in the piston-cylinder mechanism (b'), comprising a receiver extension (20), a weight (30), a reaction spring (40), and a buttcap spacer (50). The receiver extension (20) is connected to the rear side of the lower receiver (c') that accommodates the piston-cylinder mechanism (b'). The weight (30) and the reaction spring (40) are mounted inside the receiver extension (20). The reaction spring (40) is connected between the weight (30) and the buttcap spacer (50). The piston (10) has its rear side mounted with a piston spring (101). The piston spring (101) has its one end received in the piston (10), and its other end stopped against an inside wall of the lower receiver (c'). Further, a connection rod (60) is movably inserted through the lower receiver (c') and connected between the piston spring (101) and the weight (30). The toy rifle further comprises a transmission mechanism (d'), a trigger (e') and a bullet pusher (f'). When pressed the trigger (e'), the transmission mechanism (d') is forced to move the piston-cylinder mechanism (b'), causing the bullet pusher (f') to push the bullet into the firing position for striking by (the firing pin of) the piston (10). During movement of the transmission mechanism (d'), the piston (10) is moved backwards, and the connection rod (60) is moved with the piston (10) to force the weight (30) against the reaction spring (40) (see FIG. 2). When over the compression limit of the reaction spring (40), the reaction spring (40) forces the weight (30) forwards, and the piston (10) is moved forwards in a rush to shoot the bullet (see also FIG. 1). During forward movement of the weight (30), a reactive force is produced, causing a backlash vibration.

[0004] According to the aforesaid design, the connection rod (60) is connected between the piston spring (101) and the weight (30) and has its front end suspending in the piston (10), the inside wall of the piston (10) will strike the front end of the connection rod (60) during backward

movement of the piston (10), and the front end of the connection rod (60) will strike the inside wall of the piston (10) during forward movement of the weight (30). Due to the aforesaid problem, the piston (10) wears quickly with use. Further, the buttcap spacer (50) is formed integral with the rear side of the receiver extension (20). In case of a component inside the receiver extension (20) is damaged, the buttcap spacer (50) cannot be opened for enabling the damaged component to be taken out of the receiver extension (20) for a replacement. Further, the pressure of the backlash is determined subject to the weight of the weight (30) and the spring force of the reaction spring (40) and the piston spring (101). However, because the weight of the weight (30) is fixed, the spring force of the reaction spring (40) and the piston spring (101) will be gradually reducing after a long use. In consequence, the backlash vibration will become relatively smaller after a long use of the toy rifle. Further, in actual practice, a gun with backlash vibration has a relatively lower firing accuracy than a gun without backlash vibration. This is the reason why conventional toy guns with backlash vibration are not suitable for people who require high firing accuracy. Therefore, an improvement in this regard is necessary.

SUMMARY OF THE INVENTION

[0005] The present invention has been accomplished under the circumstances in view.

[0006] It is the main object of the present invention to provide a toy rifle (air soft rifle/BB-rifle) backlash vibration structure that allows adjustment of the level of the backlash vibration within a predetermined range from zero to the maximum.

[0007] It is another object of the present invention to provide a toy rifle backlash vibration structure that facilitates replacement of the component parts.

[0008] It is still another object of the present invention to provide a toy rifle backlash vibration structure that greatly prolongs the service life of the piston.

[0009] To achieve these and other objects of the present invention, the backlash vibration structure is installed in a rear side of a frame of a toy rifle in axial alignment with a piston in a piston-cylinder mechanism, comprising a receiver extension affixed to a rear side of the frame, a weight mounted in the receiver extension and axially movable along the receiver extension relative to the frame, a buttcap spacer detachably fastened to a rear side of the receiver extension, and a reaction spring connected between the weight and the buttcap spacer. The buttcap spacer is detachably fastened to a rear side of the receiver extension and mounted with an adjustment rod. Further, the weight comprises a base mounted in and movable along the receiver extension, a front tip coupled to the rear end of the piston spring, and a front extension inserted through the frame of the toy rifle and connected between the base and the front tip and inserted through the frame. The front end of the weight is directly

stopped against the rear end of the piston spring without any other connection means, therefore the invention avoids piston damage and prolongs the service life of the piston. Further, the weight has a relatively greater size and gravity weight when compared to the prior art design, therefore the invention can provide a relatively greater backlash vibration sufficient to compensate for the pressure loss due to the effect of the spring force applied by the piston spring to the weight

[0010] In one embodiment of the present invention, the buttcap spacer is detachably fastened to the rear side of the receiver extension and mounted with an adjustment rod, which is inserted through the buttcap spacer and rotatable forwards/backwards relative to the buttcap spacer. The adjustment rod can be rotated forwards to stop with a front stop plate thereof against the rear end of the reaction spring. Further, the weight has a rear extension extending axially backwardly from the rear side of the base opposite to the front extension to hold the front end of the reaction spring.

[0011] In another embodiment of the present invention, the buttcap spacer is detachably fastened to the rear side of the receiver extension and mounted with an adjustment rod, which is inserted through the buttcap spacer and the reaction spring and rotatable forwards/backwards relative to the buttcap spacer to adjust the backlash vibration. The adjustment rod can be rotated forwards to stop with its front end against the rear end of the weight, zeroing the backlash vibration. According to this alternate form, the weight has a rear extension extending axially backwardly from the rear side of the base opposite to the front extension to hold the front end of the reaction spring.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a schematic drawing of a part of a toy rifle (air soft rifle/BB-rifle) according to the prior art, showing the arrangement of the backlash vibration structure and firing of a bullet.

FIG. 2 corresponds to FIG. 1, showing the piston moved backwards and the reaction spring compressed.

FIG. 3 is a schematic drawing showing a backlash vibration structure arranged in a toy rifle (air soft rifle/BB-rifle) according to the present invention.

FIG. 4 corresponds to FIG. 3, showing the piston moved backwards and the reaction spring compressed.

FIG. 5 corresponds to FIG. 4, showing the piston moved forwards and a bullet fired.

FIG. 6 is a schematic drawing of the backlash vibration structure according to the present invention, showing adjustment of the adjustment rod.

FIG. 7 is a schematic drawing of the present invention, showing an alternate form of the mounting ar-

rangement between the reaction spring and the weight of the backlash vibration structure.

FIG. 8 is a schematic drawing of an alternate form of the present invention, showing the adjustment rod rotated relative to the buttcap spacer.

FIG. 9 corresponds to FIG. 8, showing the adjustment rod adjusted to the zero backlash position.

FIG. 10 is a schematic drawing of the backlash vibration structure according to the present invention, showing the piston moved backwards and the adjustment rod spaced from the weight at a distance.

FIG. 11 corresponds to FIG. 10, showing the piston moved forwards and a bullet fired.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] Referring to FIG. 3, a backlash vibration structure (a) is arranged at the rear side of a toy rifle in axial alignment with a piston (1) in a piston-cylinder mechanism (b). The piston (1) has a piston spring (11) mounted in its rear side. The piston spring (11) has its one end received in the rear side of the piston (1). The toy rifle further comprises a transmission mechanism (d), a trigger (e) and a bullet pusher (f) arranged under the piston-cylinder mechanism (b). When pressed the trigger (e), the transmission mechanism (d) is forced to move the piston-cylinder mechanism (b), causing the bullet pusher (f) to push the bullet into the firing position for striking by (the firing pin of) the piston (1).

[0014] The backlash vibration structure (a) comprises a receiver extension (2), a weight (3), a reaction spring (4), and a buttcap spacer (5). The receiver extension (2) is connected to the rear side of the frame (c) of the toy rifle that accommodates the piston-cylinder mechanism (b). The weight (3), the reaction spring (4) and the buttcap spacer (5) are mounted in the rear side of the receiver extension (2). The reaction spring (4) is connected between the weight (3) and the buttcap spacer (5). The weight (3) is inserted through the frame (c) with its front end and stopped against the rear end of the piston spring (11). The weight (3) comprises a cylindrical base (31), a front tip (33), a front extension (32) axially connected between the cylindrical base (31) and the front tip (33), and a rear extension (34). The cylindrical base (31) is received in the receiver extension (2). The front extension (32) is inserted through the frame (c) of the toy rifle. The front tip (33) is fastened to the rear end of the piston spring (11) opposite to the piston (1). As shown in FIG. 7, the rear extension (34) extends axially backwardly from the rear side of the cylindrical base (31) opposite to the front extension (32) to hold the front end of the reaction spring (4).

[0015] Further, the buttcap spacer (5) is detachably fastened to the rear side of the receiver extension (2) (by, for example, a screw joint; see FIGS. 6 and 7). An adjustment rod (6) is inserted through the buttcap spacer (5) and stopped with its front end against the rear end of

the reaction spring (4). Further, the adjustment rod (6) has its front end fixedly mounted with a stop plate (61) that is stopped against the rear end of the reaction spring (4).

[0016] Alternatively, as shown in FIGS. 8 and 9, the buttcap spacer (5) can be detachably fastened to the rear side of the receiver extension (2) (by means of, for example, a screw bolt) and, the adjustment rod (6) can be fastened to the buttcap spacer (5) and rotatable to adjust the spring force of the reaction spring (4). As illustrated, the adjustment rod (6) can be rotated forwards and stopped against the rear end of the weight (3) (see FIG. 9). As illustrated, the buttcap spacer (5) has a screw hole (51); the adjustment rod (6) has an outer thread (62) threaded into the screw hole (51) and inserted through the reaction spring (4).

[0017] When pressed the trigger (e), the transmission mechanism (d) is forced to move the piston (1) backwards (see FIGS. 4 and 10). At this time, the weight (3) is forced backwards by the piston spring (11) to compress the reaction spring (4). When over the compression limit, the reaction spring (4) forces the weight (3) forwards, and the piston (1) is forced forwards by the piston spring (11) to strike the bullet, causing shooting of the bullet (see FIGS. 5 and 11). During forward movement of the weight (3), a backlash vibration is produced, simulating a backlash vibration of a real rifle during firing of a bullet.

[0018] Further, the user can rotate the adjustment rod (6) (see FIGS. 6 and 8) forwards to shorten the distance between the front end of the adjustment rod (6) and the weight (3), i.e., to shorten the displacement range of the weight (3), thereby reducing the reaction spring force of the reaction spring (4), and therefore the backlash vibration is relatively reduced. On the contrary, when rotating the adjustment rod (6) backwards to increase the distance between the front end of the adjustment rod (6) and the weight (3), the displacement range of the weight (3) is relatively increased, and therefore the level of the backlash vibration is relatively increased. Further, as shown in FIG. 9, when the adjustment rod (6) is rotated to the position where the front end of the adjustment rod (6) is stopped against the free end of the rear extension (34) of the weight (3), the weight (3) is prohibited from backward displacement, and the reaction spring (4) does no work, and therefore no any backlash vibration will be produced upon firing of one bullet. This zero backlash vibration mode fits the requirement for high firing accuracy. Further, when a component part replacement is necessary, the buttcap spacer (5) can be removed from the rear side of the receiver extension (2) to facilitate the component part replacement work. Further, by means of changing the gravity weight of the weight (3) or the spring strength of the reaction spring (4), the backlash vibration is relatively changed.

[0019] In conclusion, the backlash vibration structure according to the present invention has the advantages and features as follows:

1. Because the front end of the weight (3) is directly stopped against the rear end of the piston spring (11) without any other connection means, the invention avoids piston damage, and therefore the service life of the piston (1) is prolonged. When compared to the prior art design, the weight (3) has a relatively greater size and gravity weight, and therefore the invention can provide a relatively greater backlash vibration sufficient to compensate for the pressure loss due to the effect of the spring force applied by the piston spring (11) to the weight (3).

2. The arrangement of the adjustment rod (6) allows adjustment of the backlash vibration from within a predetermined range from zero to the maximum to fit different application requirements.

3. The buttcap spacer (5) can be removed from the rear side of the receiver extension (2) to facilitate the component part replacement work.

[0020] Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention.

Claims

1. A backlash vibration structure (a) arranged at a rear side of a toy rifle in axial alignment with a piston (1) in a piston-cylinder mechanism (b), said piston (1) having a piston spring (11) mounted in a rear side thereof, said piston spring (11) having one end thereof received in a rear side of said piston (1), said backlash vibration structure (a) comprising a receiver extension (2), a weight (3), a reaction spring (4), and a buttcap spacer (5), said receiver extension (2) being connected to a rear side of a frame (c) of said toy rifle that accommodates said piston-cylinder mechanism (b), said weight (3), said reaction spring (4) and said buttcap spacer (5) being mounted in a rear side of said receiver extension (2), said reaction spring (4) being connected between said weight (3) and said buttcap spacer (5), **characterized in that** said weight (3) is inserted through said frame (c), having a front end thereof stopped against a rear end of said piston spring (11).
2. The backlash vibration structure as claimed in claim 1, wherein said weight (3) comprises a front tip (33) fastened to the rear end of said piston spring (11) opposite to said piston (1).
3. The backlash vibration structure as claimed in claim 2, wherein said weight (3) further comprises a cylindrical base (31), and a front extension (32) axially connected between said cylindrical base (31) and said front tip (33), said cylindrical base (31) being

received in said receiver extension **(2)**, said front extension **(32)** and said front tip **(33)** being inserted through the frame **(c)** of said toy riffle at a rear side of said piston-cylinder mechanism **(b)**.

5

4. The backlash vibration structure as claimed in claim 1, 2 or 3, wherein said buttcap spacer **(5)** is detachably fastened to the rear side of said receiver extension **(2)** and mounted with an adjustment rod **(6)**, said adjustment rod **(6)** being inserted through said buttcap spacer **(5)** and rotatable forwards/backwards relative to said buttcap spacer **(5)**, said adjustment rod **(6)** being rotatable forwards to stop with a front end thereof against a rear end of said reaction spring **(4)**. 10 15
5. The backlash vibration structure as claimed in claim 4, wherein said adjustment rod **(6)** has the front end thereof fixedly mounted with a stop plate **(61)** that is stopped against the rear end of said reaction spring **(4)**. 20
6. The backlash vibration structure as claimed in claim 4, wherein said weight **(3)** further comprises a rear extension **(34)** extending axially backwardly from a rear side of said cylindrical base **(31)** opposite to said front extension **(32)** to hold the front end of said reaction spring **(4)**. 25
7. The backlash vibration structure as claimed in claim 1, 2 or 3, wherein said buttcap spacer **(5)** is detachably fastened to the rear side of said receiver extension **(2)** and mounted with an adjustment rod **(6)**, said adjustment rod **(6)** being inserted through said buttcap spacer **(5)** and rotatable forwards/backwards relative to said buttcap spacer **(5)**, said adjustment rod **(6)** being rotatable forwards to stop with a front end thereof against a rear end of said weight **(3)**. 30 35 40
8. The backlash vibration structure as claimed in claim 7, wherein said adjustment rod **(6)** is inserted through said buttcap spacer **(5)** and said reaction spring **(4)**. 45
9. The backlash vibration structure as claimed in claim 8, wherein said weight **(3)** further comprises a rear extension **(34)** extending axially backwardly from a rear side of said cylindrical base **(31)** opposite to said front extension **(32)** to hold the front end of said reaction spring **(4)**. 50 55

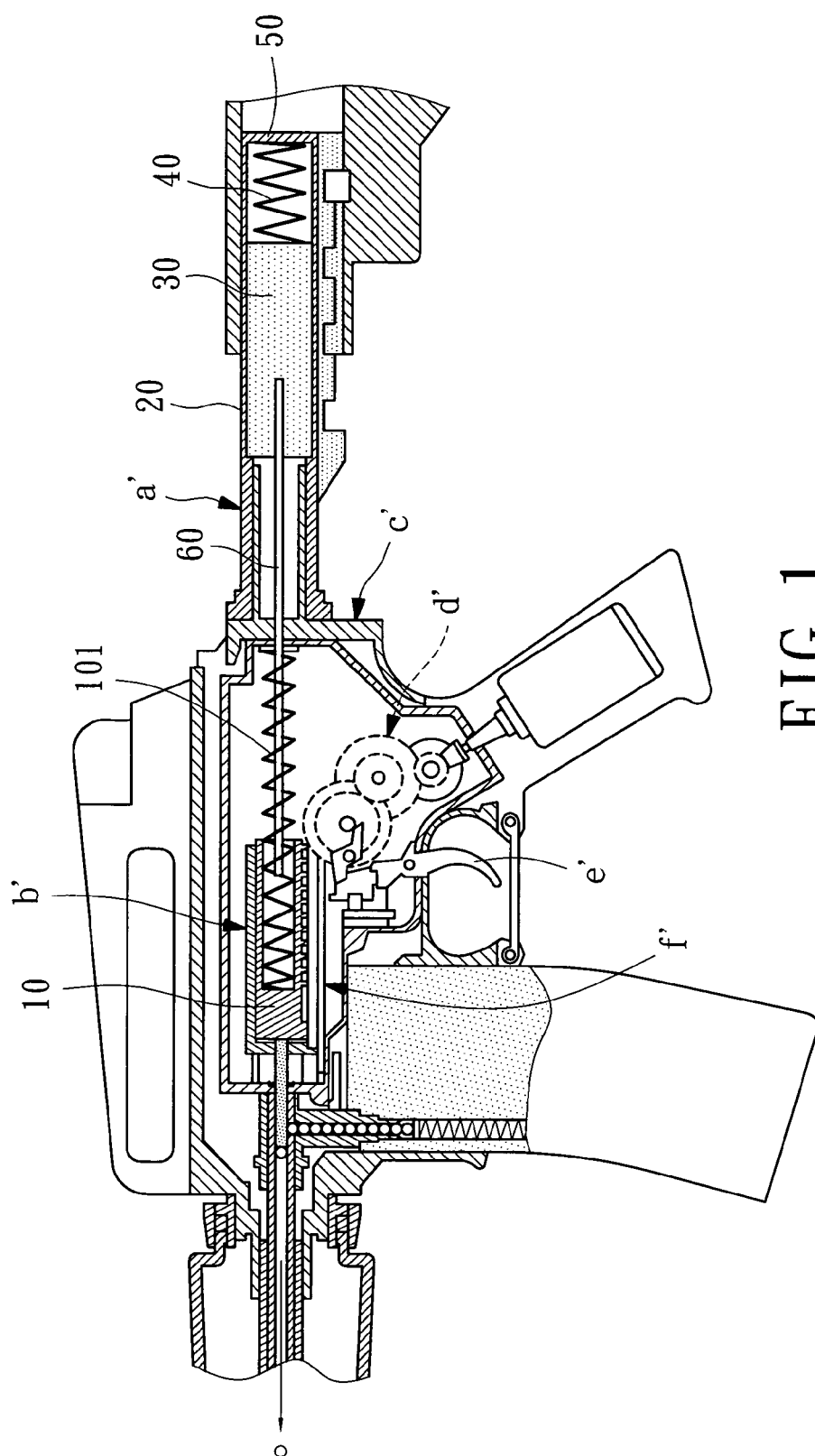


FIG. 1
(Prior Art)

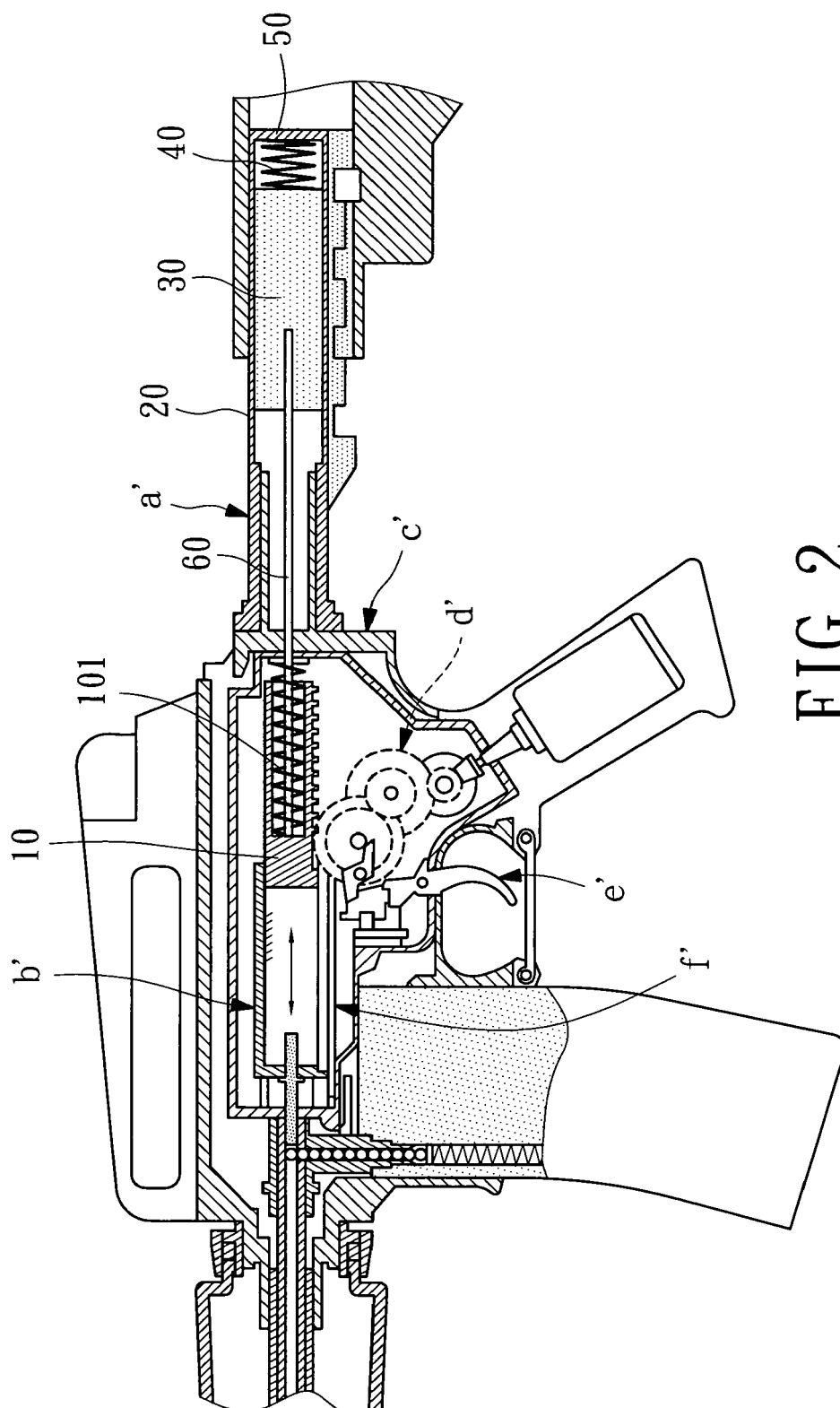


FIG. 2
(Prior Art)

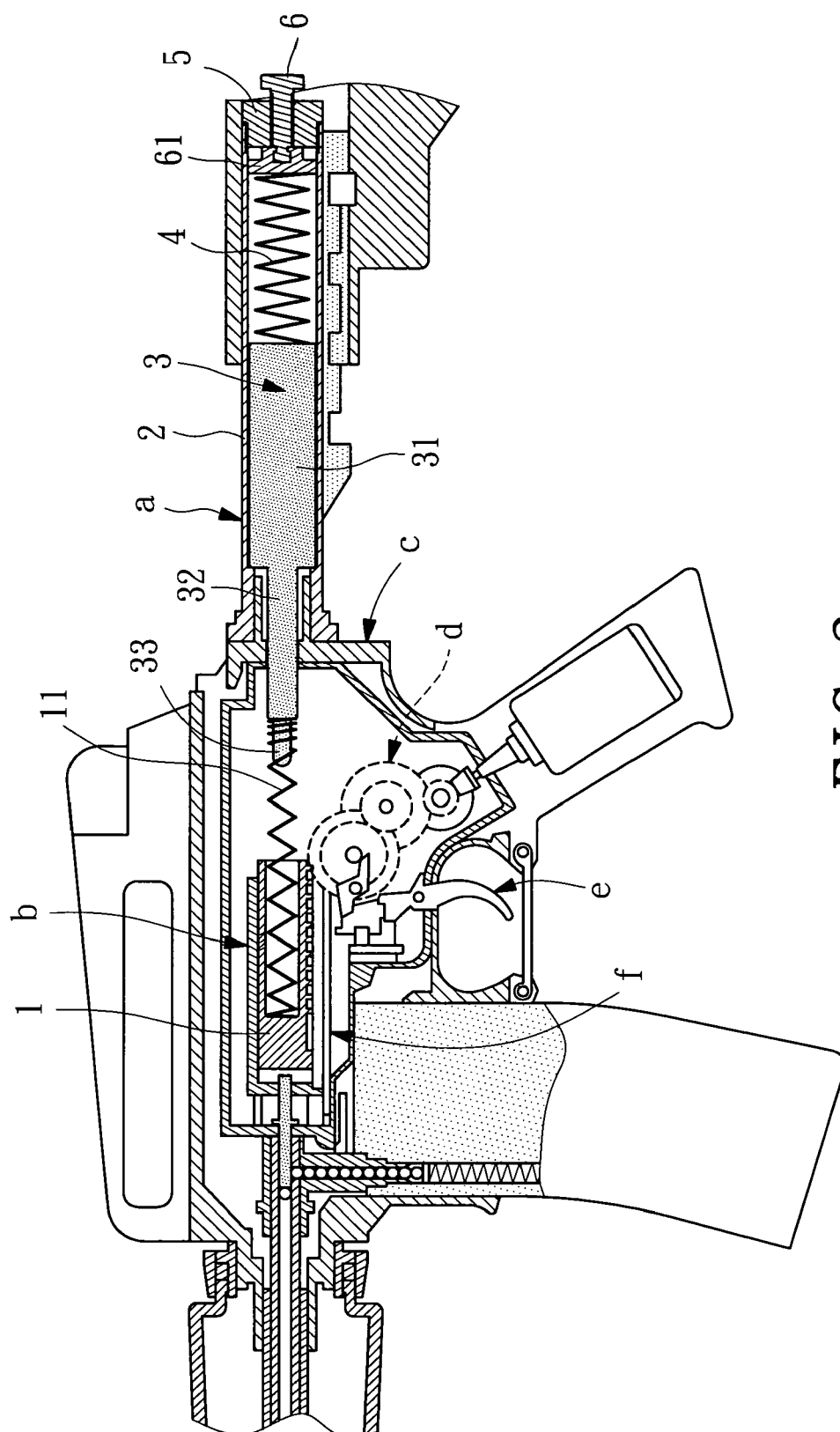


FIG. 3

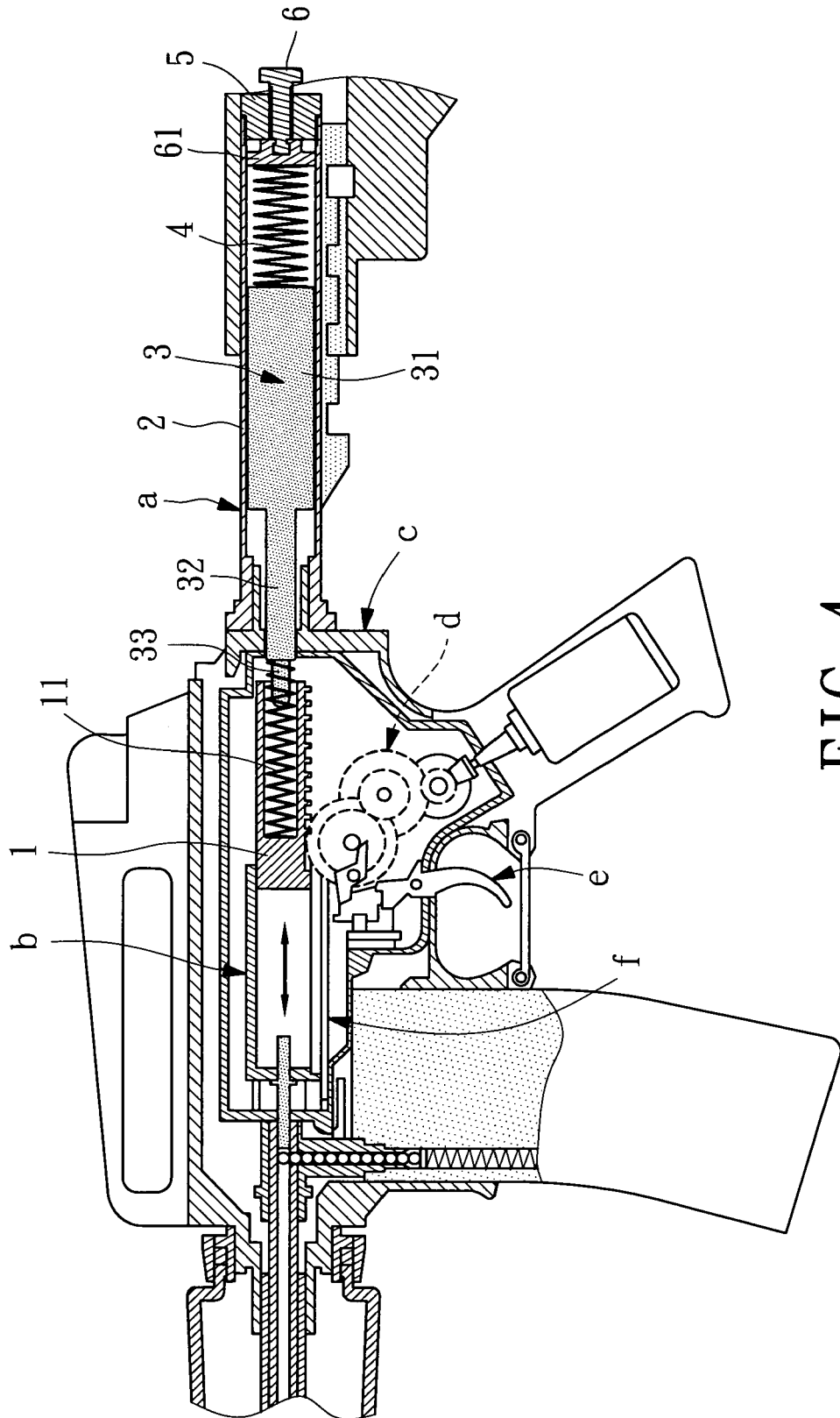


FIG. 4

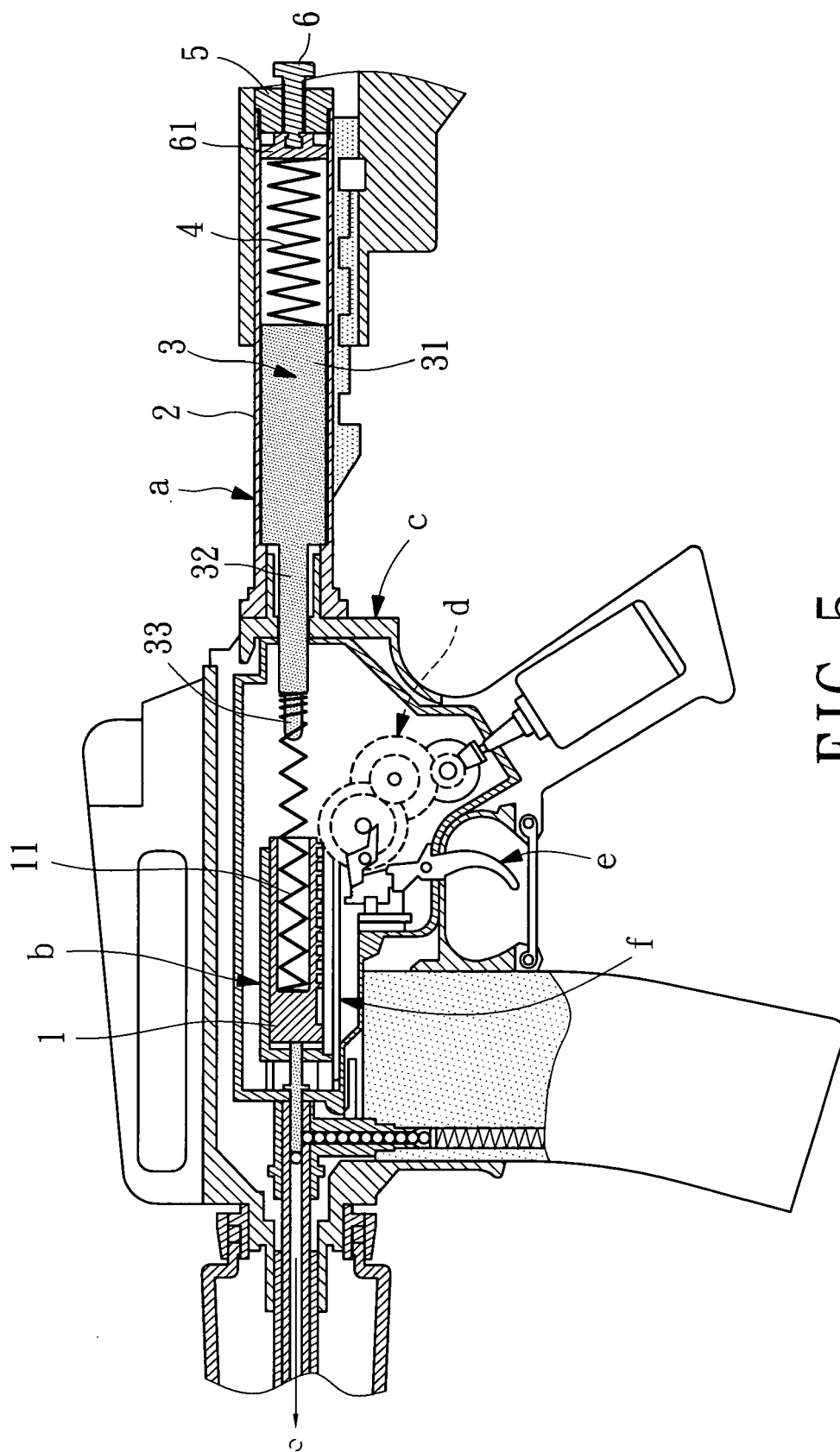


FIG. 5

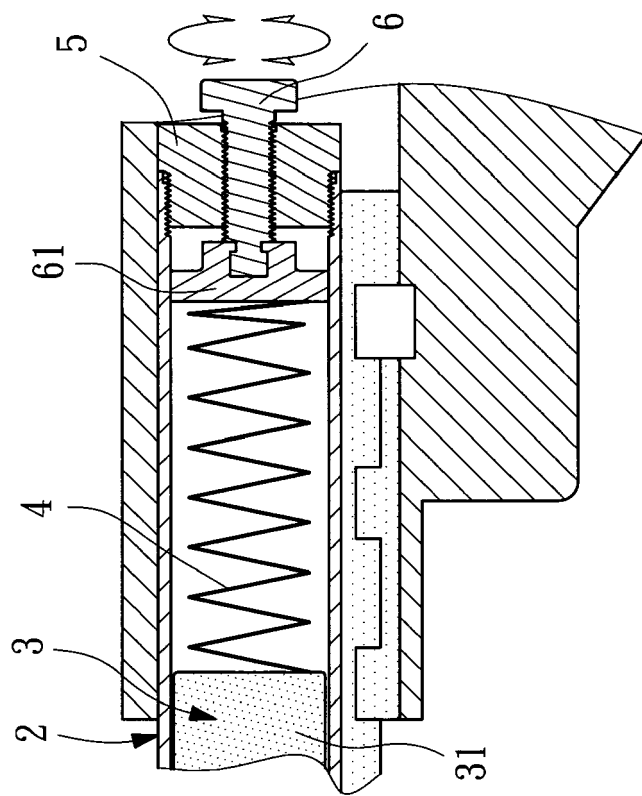


FIG. 6

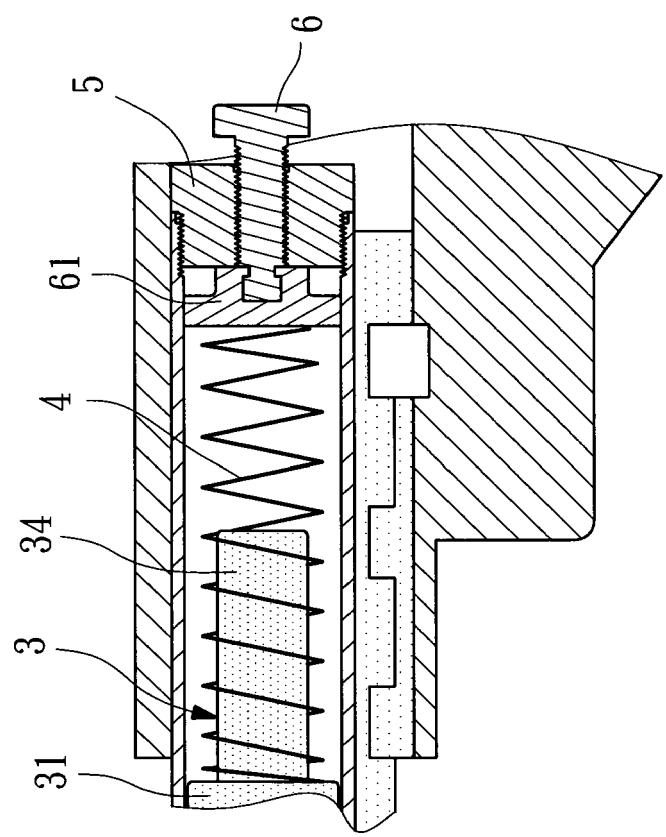


FIG. 7

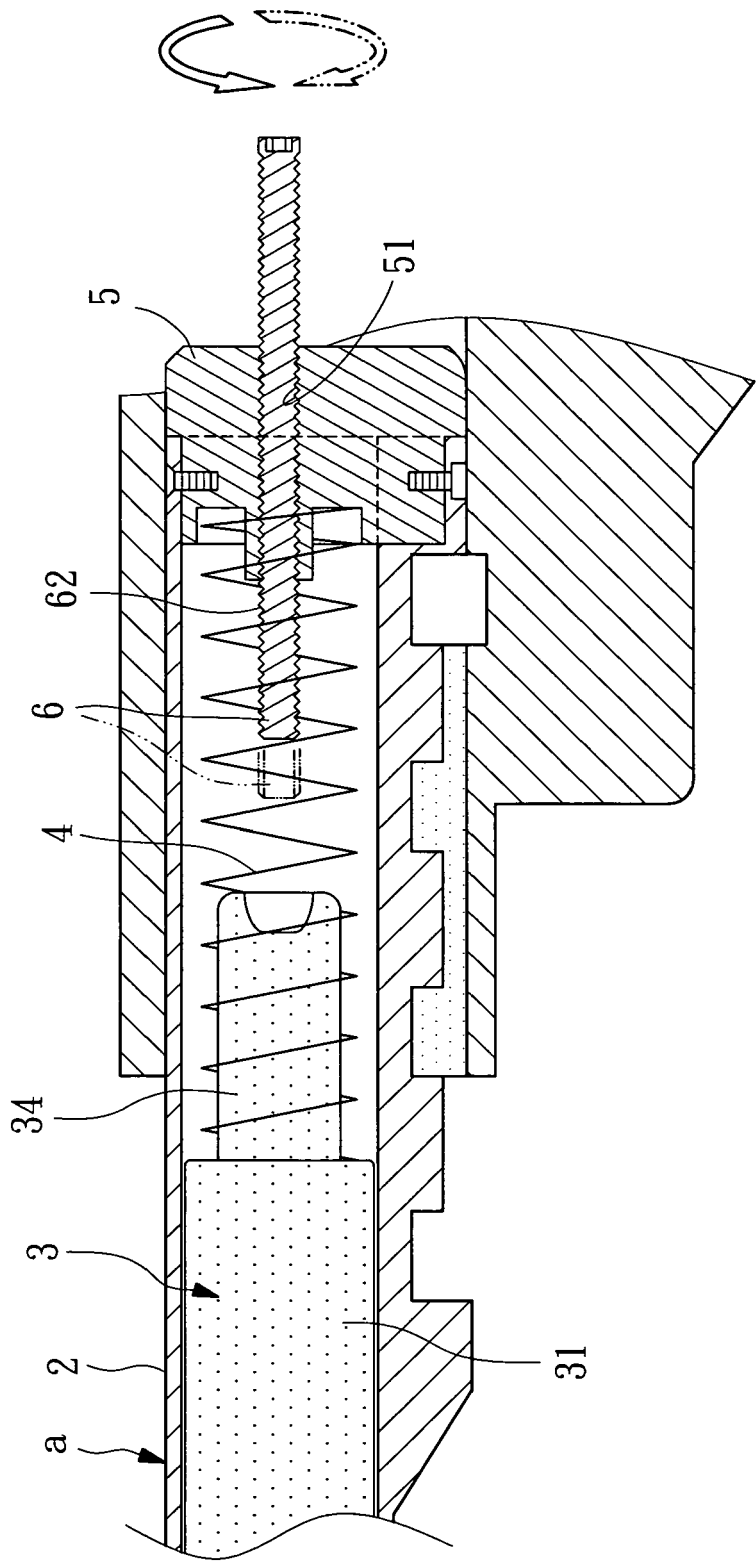


FIG. 8

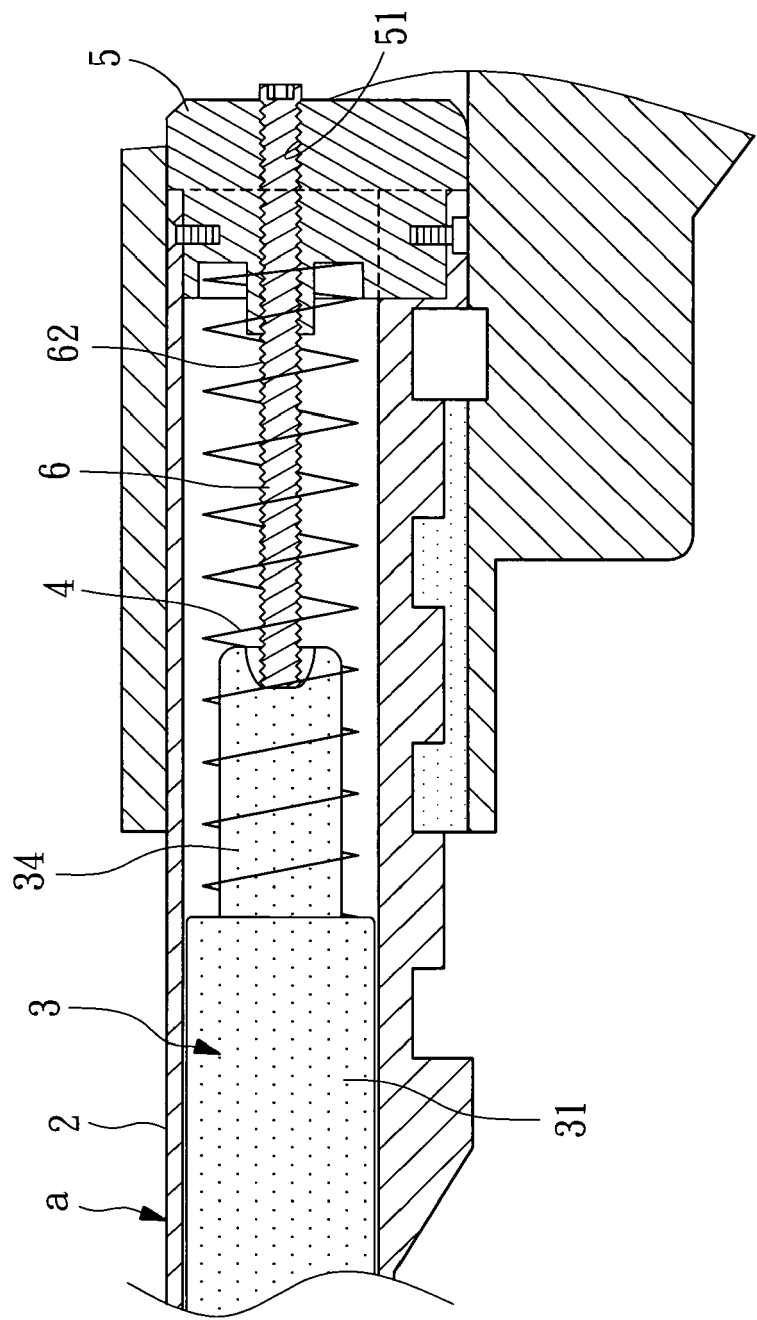


FIG. 9

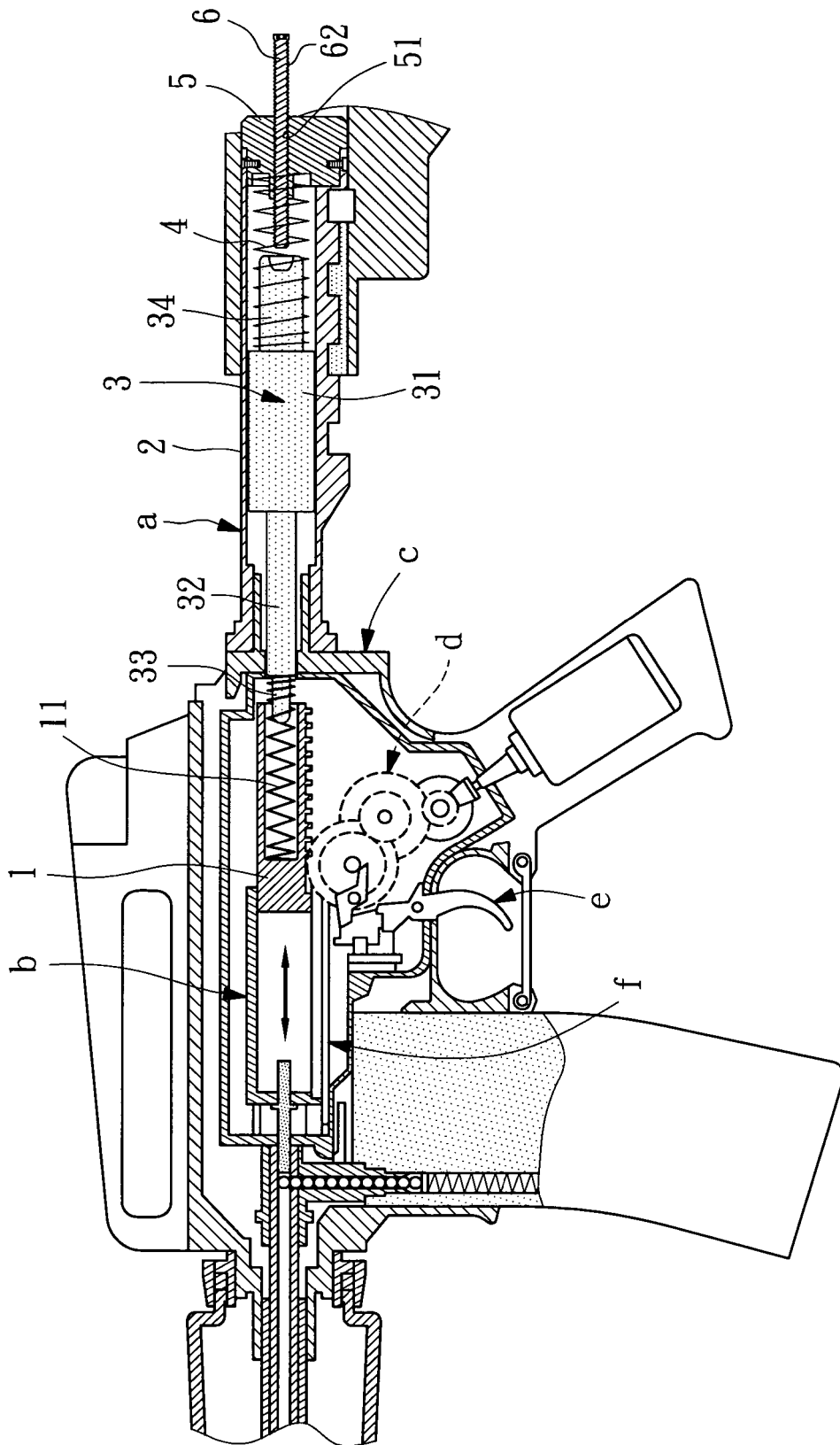


FIG. 10

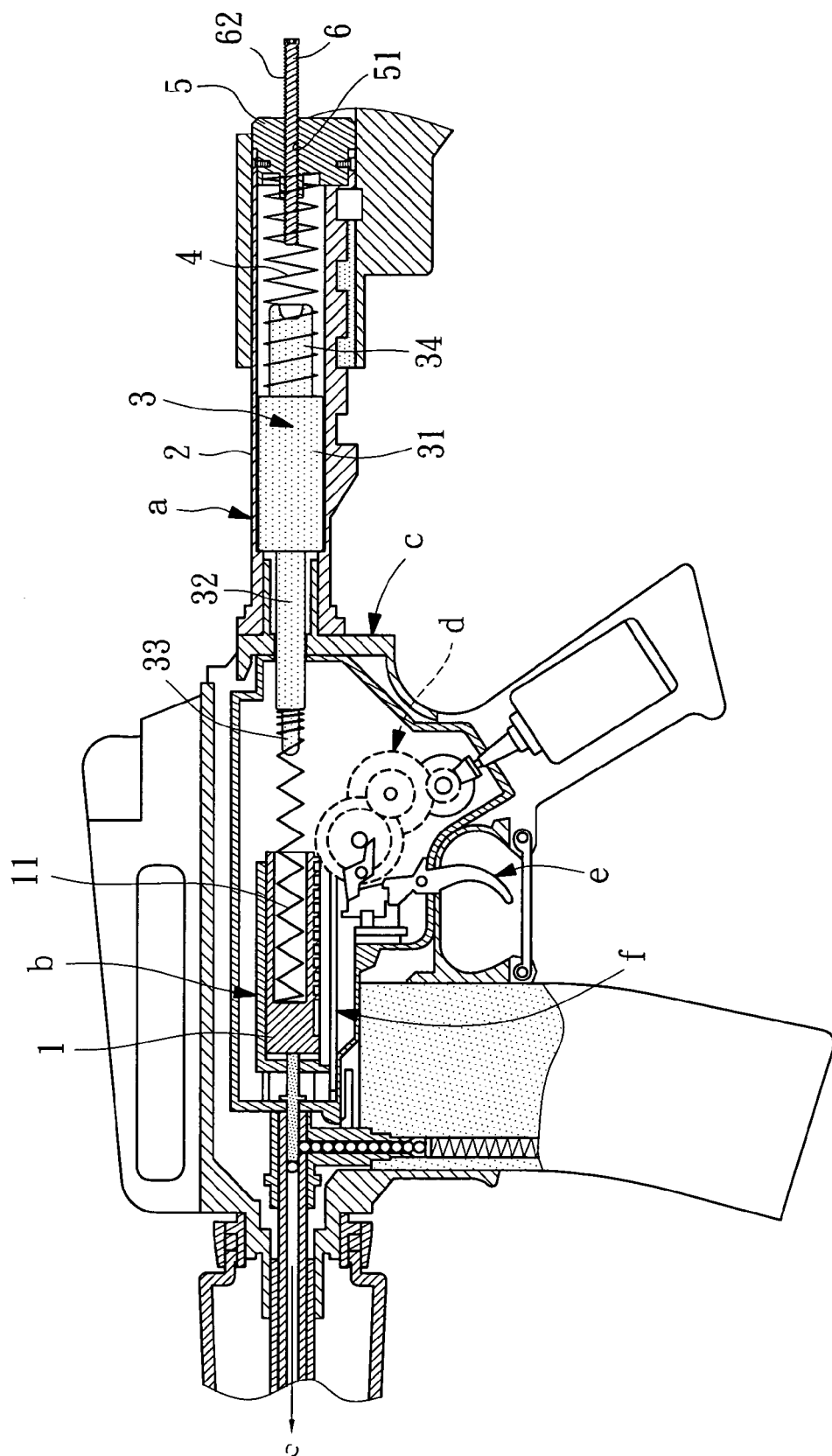


FIG. 11



EUROPEAN SEARCH REPORT

Application Number
EP 08 36 0037

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2008/155875 A1 (IWASAWA TATSUO [JP]) 3 July 2008 (2008-07-03) * abstract; figures 1-4 * * paragraphs [0024], [0026] * -----	1	INV. F41A33/06 F41B11/14
A	US 6 618 975 B1 (SHIH PAO-TUNG [CN]) 16 September 2003 (2003-09-16) * abstract; figure 3 * * column 2, line 66 * * column 3, line 10 * -----		
			TECHNICAL FIELDS SEARCHED (IPC)
			F41A F41B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 April 2009	Examiner Schwingel, Dirk
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

2
EPO FORM 1503 03.82 (P04G01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 36 0037

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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17-04-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008155875	A1	03-07-2008	NONE
US 6618975	B1	16-09-2003	NONE

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- TW 200708712 [0002]