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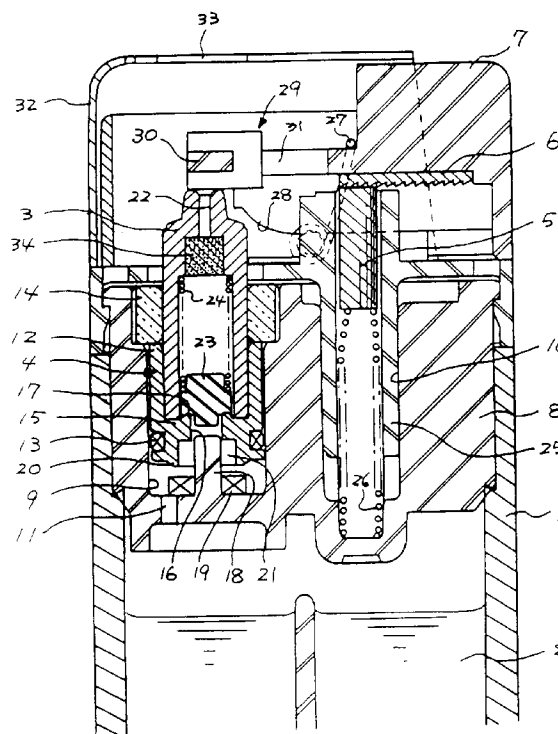
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(54) **Pocket lighter.**

(57) A pocket lighter is disclosed which comprises a measuring chamber (21, 125) an inlet valve (19, 20, 117, 120) and an outlet valve (17, 23, 119, 124), the inlet and outlet valves (19, 20, 117, 120, 17, 23, 119, 124) being arranged such that opening of the outlet valve (17, 23, 119, 124) permits fuel to flow from the measuring chamber (21, 125) resulting in the inlet valve (19, 20, 117, 120) being closed, and closing of the outlet valve (17, 23, 119, 124) results in the inlet valve (19, 20, 117, 120) being opened to permit fuel to flow into the measuring chamber (21, 125).

Fig. 3



Pocket lighters, for example cigarette lighters commonly comprise a reservoir in which liquefied gas fuel is stored under pressure, the gas being ignited at a burner nozzle attached to an integral burner valve, in use. Ignition occurs when the fuel is permitted to flow beyond the open burner valve nozzle connected to the reservoir. In such lighters, the supply of fuel to the burner nozzle is only interrupted when the burner valve is closed. The continuous burning of fuel through failing to close the valve has often caused accidents, for example fires, burns and the like. There is concern that misuse of lighters by children may result in a large accident. In order to avoid these dangers, a new lighter has been developed in which only a fixed and limited quantity of fuel is permitted to flow out of the lighter during each use of the lighter, and once the fixed quantity is exhausted, the burning terminates, the supply of fuel being exhausted.

The present invention has been developed in view of these situations.

An object of this invention is to provide a lighter, wherein only a fixed and limited quantity of gas fuel is supplied for one ignition during valve opening. After the quantity is used up the lighter is automatically extinguished.

According to the present invention there is provided a pocket lighter characterised by a measuring chamber an inlet valve and an outlet valve, the inlet and outlet valves being arranged such that opening of the outlet valve permitting fuel to flow from the measuring chamber results in the inlet valve being closed, and closing of the outlet valve results in the inlet valve being opened to permit fuel to flow into the measuring chamber.

This invention operates as follows: when an operating lever is actuated, a burner nozzle and valve body descend together, closing the inlet valve and opening the outlet valve the reverse movement of the lever causing the inlet valve to open and the outlet valve to close. The measuring space is defined between the inlet and outlet valves, a fixed quantity of fuel being held in the measuring space, in use.

During actuation of the operating lever, the burner nozzle and the valve body are pushed downward simultaneously. When the burner valve moves down, the valve member of the inlet valve contacts tightly onto the respective valve seat, closing the inlet valve. The valve member of the outlet valve is pushed upwards by a bar separating the member from the respective valve seat. Accordingly, gas fuel stored in the measuring space including a gas fuel storing space is emitted through a nozzle aperture and the fuel is ignited. As the inlet valve is closed, the supply of gas fuel from a reservoir to the burner nozzle is prevented, only the fixed quantity of fuel in the measuring space being permitted to flow to the nozzle. The exhaustion of the fuel automatically results in the flame of the lighter being extinguished.

In an alternative embodiment, when an operating lever is actuated, a burner nozzle and valve body are both lifted resulting in the contact between the valve member of the outlet valve and a respective valve seat being released while the valve member of the inlet valve and a respective valve seat are brought into contact with one another, the fixed quantity of gas fuel being provided in the measuring space formed between the inlet and outlet valves.

Such movement of the operating lever results in opening of the outlet valve and closing of the inlet valve, thus gas fuel stored in the measuring space including a gas fuel storing space is emitted through a nozzle aperture and the fuel is ignited. As the tight contact between the inlet valve member and inlet valve seat is maintained, the further supply of fuel from a reservoir is completely interrupted, and hence when the fixed quantity of fuel is exhausted, the flame is automatically extinguished.

The invention will further be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of a lighter of a first embodiment of the invention;

Figure 2 is a perspective view of the lighter of Figure 1 when ignited;

Figure 3 is an expanded sectional view of the lighter of Figure 1;

Figure 4 is an expanded sectional view of the lighter of Figure 1, in use;

Figure 5 is an enlarged transverse sectional view of the view of Figure 3;

Figure 6 is an enlarged transverse sectional view of the view of Figure 4;

Figure 7 is an exploded perspective view of main parts;

Figure 8 shows the flow of gas fuel when the valve is open;

Figure 9 is a longitudinal sectional view of a second embodiment of the present invention;

Figure 10 is an enlarged fragmentary longitudinal sectional view of the embodiment of Figure 9 with the outlet valve closed; and

Figure 11 is an enlarged fragmentary longitudinal sectional view of the embodiment of Figure 9 with the outlet valve open.

Figure 1 ~ Figure 8 show the first embodiment of the present invention. A disposable pocket lighter 1, has a fuel reservoir 2 provided on its lower portion. On the upper portion of the lighter 1 above the reservoir 2, an ignition mechanism is mounted, comprising an operating lever 7 operating a burner nozzle 3 of a burner valve 4 as well as a sparking rasp 6 for rubbing against a flint 5.

Referring to Figure 3 ~ Figure 7, the lighter is of oval cylindrical shape and is made of synthetic resin material, and comprises the reservoir 2 on the lower portion thereof, a block body 8 on the upper portion

thereof for the ignition mechanism to be mounted upon, tightly sealed against the reservoir 2. Thus, the reservoir 2 is established. On the block body 8, two pits 9, 10 are provided parallel to one another, both having open tops and closed bottoms. The first pit 9 is of larger diameter than the second pit 10, and the first pit 9 is positioned on the one side of the block body 8 and communicates with the reservoir 2 via a small aperture 11. A burner valve body 12 is movable within the first pit 9. The burner valve body 12 is a cylindrical member having an open top and a closed bottom. An O-ring 13 is provided on the lower and outer surface of the valve body 12. The ring 13 tightly seals the gap formed by the inner surface of the first pit 9 and the outer surface of the burner valve body 12. A binding ring 14 is screwed into the open end of the first pit 9 and prevents the burner valve body 12 from falling out of the first pit 9, in use. A penetrating aperture 16 is drilled on the central portion of a separation wall 15 closing the bottom of the burner valve body 12. An outlet valve seat 17 is formed around the upper circumference of the aperture 16. A bar 18 is provided at the centre of the inside of the bottom of the first pit 9, and is capable of moving freely into and out of the aperture 16. An inlet valve member 19 is provided around the circumference of the bar 18, and the valve member 19 is arranged to contact or become detached from an inlet valve seat 20 provided on the bottom of the burner valve body 12 according to the movement of the body 12. The inner space of the burner valve body 12 between the inlet valve seat 20 and the separation wall 15 is of enlarged width, this space defining a gas fuel storing space 21.

The burner nozzle 3 is forcibly inserted into the burner valve body 12 by caulking to form one integral part. The burner nozzle 3 is a cylindrical member having a nozzle aperture 22 provided in the upper portion thereof, and an opening receiving a movable outlet valve member 23 arranged to contact or become detached from the outlet valve seat 17. The outlet valve member 23 is normally forced downwards by a spring 24 provided in the burner nozzle 3, namely toward the outlet valve seat 17 and is forcibly engaged with the seat 17. The material of the outlet valve member 23 and the inlet valve member 19 is an elastic material like rubber. A fuel flow regulating member 34 is next to the nozzle aperture 22 in the burner nozzle 3. This regulating member 34 is made from porous material, such as sintered metal, sintered plastic, ceramics and so on, which permits a fixed quantity of gas fuel to pass through. This member 34 prevents the fuel stored in the fuel storing space 21 from being delivered suddenly. The sintered plastic is made of polyethylene, polyacetal or the like after grains of these plastics materials have been sintered by heat or ultrasonic processes.

When the burner nozzle 3 is pushed downwards, the burner valve body 12 also descends. By this de-

scent, the inlet valve seat 20 located in the lower portion of the burner valve body 12 contacts tightly onto the inlet valve member 19 to close the inlet valve. The bar 18 moves through the penetrating aperture 16 as burner valve body 12 descends, and pushes the outlet valve member 23 upwards, whereby the outlet valve member 23 is separated from the outlet valve seat 17 to open the outlet valve. Thus, the fuel in the fuel storing space 21 is delivered through the nozzle aperture 22. As the inlet valve is closed, no fuel supply is permitted into the fuel storing space 21. Therefore only the fixed and limited amount of fuel remaining in the space 21 is permitted to be delivered. The actual quantity of gas fuel in the space defined between the inlet and outlet valves, and accordingly the actual quantity is not limited to the amount in the fuel storing space 21. In this specification, therefore, we define the space containing the actual quantity to be delivered as the measuring space. This measuring space is mainly dependent upon the size of the fuel storing space 21.

The second pit 10 is parallel to the first pit 9. A flint holder 25 of cylindrical shape is provided in the pit 10, and a flint 5 is provided in the holder and is forced constantly outwards by a flint spring 26. A sparking rasp 6 is located in direct contact with the flint 5. In the present embodiment, the sparking rasp 6 is in the form of a flat plate which is different from the normal style of a wheel. The required sparking for ignition is generated by the horizontal sliding rubbing motion between the flint 5 and the rasp 6.

The operating lever 7 is provided on the upper portion of the block body 8 and is capable of free sliding movement in the horizontal direction, and it is normally biased by a helical spring 27 to a standstill position as shown in Figure 3. On the lower surface of the operating lever 7 is a nozzle thruster 28 having a circular arc-shaped lower surface which is integral with the body. The sparking rasp 6 is adhered to the rear bottom surface of the lever 7. A shutter 29 is also located horizontally on the front portion of the lever 7 just above the thruster 28. The shutter 29 has two members, one being a closing member 30 and the other an opening member 31, and when the sliding movement of the operating lever 7 occurs, the closing member 30 leaves the upper portion of the burner nozzle 3 and is replaced by the opening member 31, the upper portion of the burner nozzle 3 being opened. A windshield 32 is provided which covers the burner nozzle 3, the shutter 29, one portion of the operating lever 7 and the block body 8. This windshield 32 is mounted on the lighter body 1. A flame emerging aperture 33 is also directly above the nozzle aperture 22 in the burner nozzle 3. A stopper mechanism is recommended for the sliding action of the operating lever 7, so that random and sudden ignitions may be avoided. This stopper reduces danger caused by the child misuse.

In order to ignite the lighter, the operating lever 7 is slid toward the windshield 32 forcibly as shown in Figure 4 and Figure 6. The sliding movement operates to rub the flint 5 against the sparking rasp 6, and thus emitting sparks adjacent the burner nozzle 3. By this same operation, the thruster 28 contacts the neck portion of the burner nozzle 3 to lower the burner nozzle 3, and the shutter 29 is moved, so that the opening member 31 is positioned at the upper portion of the nozzle 3, and thus the nozzle is opened. At the end of the descent of the burner nozzle 3, the inlet valve member 19 contacts tightly onto the inlet valve seat 20, whereby the measuring space including the fuel storing space 21 is isolated from the fuel reservoir 2. The bar 18 pushes up the outlet valve member 23 against the action of the spring 24 and the valve member 23 is separated from the outlet valve seat 17 to open the outlet valve. When the outlet valve is opened as above, with reference to Figure 8, the fuel stored in the measuring space moves upward through the nozzle 3 to be delivered through the nozzle aperture 22, and finally the fuel is ignited by the sparks, forming a flame extending through the flame emerging aperture 33. When the fuel stored in the measuring space is exhausted, the flame extinguishes itself because there is no further supply of fuel from the fuel reservoir 2. In other words, the flame is maintained only for a limited time during burning of the fixed quantity of fuel in the measuring space. After the consumption of the fuel, the flame automatically dies out.

After cigarette ignition, when the operating lever 7 is released, the power of the helical spring 27 drives the lever 7 into the original place, whereon the force on the burner nozzle 3 is also released. Next, the burner nozzle 3 is elevated to its normal position by the spring 24 and the gas pressure exerted on the valve member 23 and the outlet valve closes. At the same time, by the elevation of the burner nozzle 3, the inlet valve opens, whereon the measuring space again communicates with the fuel reservoir 2 to permit the fuel to flow through the aperture 11 to fill the measuring space ready for the next ignition.

As the closing member 30 of the shutter 29 is driven by the synchronous movement of the operating lever 7, it covers the nozzle aperture 22, and the flame stops its continuous burning, even if there is fuel remaining. In this embodiment, the quantity of gas fuel is fixed at an amount necessary for a single burn. If the operating lever 7 should be unexpectedly released earlier than the time for the fixed quantity to burn, it may be feared that some undesirable burning is continued. Therefore, it is preferable to design the shutter 29 for the automatic extinguishment.

The second example of the invention is described with reference to Figures 9 to 11. The lighter of this embodiment is a normal disposable lighter equipped with a sparking wheel as the ignition mechanism and

with a push down lever.

A lighter body 101, having a reservoir 102 on its lower portion includes an ignition mechanism mounted on its top portion over the reservoir 102. The ignition mechanism comprises a burner valve 104 including a burner nozzle 103, a flint 105, a sparking wheel 106 and an operating lever 107 which operates the burner valve 104 and the wheel 106.

With reference to Figure 9 ~ Figure 11, a lighter body is produced of synthetic resin material, having the reservoir 102 on its lower portion and having a block body 108 for the ignition mechanism on its top portion, and the body 108 is tightly sealed against the reservoir 102. On the block body 108, two pits 109, 110 are provided parallel to one another, both having open tops and closed bottoms. The first pit 109 is of larger diameter than the second pit 110, and the pit 109 is formed on one side of the block body 108 and communicates with the reservoir 102 via a small aperture 111. A burner valve body 112 is movable within the first pit 109. The burner valve body 112 is a cylindrical member having an open top and closed bottom. An O-ring 113 is on the lower and outer surface of the valve body 112, whereas the ring 113 tightly seals the gap produced between the inner surface of the first pit 109 and the outer surface of the burner valve body 112. On the central portion of a separation wall 115 closing the bottom of the burner valve body 112, a penetrating aperture 116 is provided, an outlet valve seat 124 being formed around the upper circumference of the aperture 116. A movable valve member 118 moves freely upwards and downwards in the burner valve body 112. The movable member 118 is produced from a compressible elastic sealing material such as rubber. This movable member 118 defines an outlet valve element 119 and an inlet valve element 120 below the outlet valve element 119, the elements 119, 120 being connected by a coupler 121 of small diameter. A bar 122 extends downward from the central portion of the inlet valve element 120, and the bar 122 passes through the penetrating aperture 116 to freely contact the inner bottom surface of the first pit 109.

The burner nozzle 103 is screwed into the burner valve body 112 from the mouth, and these two parts 103, 112 act as a single integral member. The burner nozzle 103 is cylindrical in shape, having a small nozzle aperture 123 provided on the top thereof and having an open bottom, and the outlet valve element 119 is arranged to contact and become detached from the outlet valve seat 124 which is formed on the inner bottom surface of the burner nozzle 103. The movable valve member 118 is normally pressurized downwards by a spring 114 located between the bottom surface of the burner nozzle 103 and the top surface of the inlet valve element 120. The integral member 123, 112 urges the bar 122 into contact with the bottom surface of the first pit 109. By this urging, the out-

let valve element 119 contacts tightly onto the bottom surface of the outlet valve seat 124 to close the passage to the nozzle aperture 123, while the inlet valve element 120 is separated from the inlet valve seat 117 to permit fuel to flow into a fuel storing space 125 through the small aperture 111. The fuel storing space 125 is a measuring space to measure a fixed quantity of fuel, and only this fixed quantity is emitted through the nozzle aperture 123 when the valve is opened. A fuel flow regulating member 126 is also provided adjacent the nozzle aperture 123. The member 126 is made from porous material exactly same as the first embodiment, and the material only permits a fixed quantity of gas fuel to pass through.

When the operating lever 107 is pushed down, the burner nozzle 103 and the burner valve body 112 are driven upward. The elevation of the burner valve body 112 promotes the contact between the inlet valve element 120 and the inlet valve seat 117 to close the inlet valve. Moving in the opposite direction to the upward movement of the burner valve body 112, the movable valve member 118 moves down under the force of the spring 114. As shown in Figure 11, the outlet valve element 119 is separated from the outlet valve seat 124 to produce a space therebetween, opening the outlet valve. Then the fuel stored in the storing space 125 is permitted to flow through the nozzle aperture 123. The tight contact between the inlet valve element 120 and the inlet valve seat 117 prevents the flow of fuel from the reservoir 102 into the fuel storing space 125, and therefore only the fixed quantity of fuel measured by the measuring space including the fuel storing space 125 is permitted to flow through the nozzle aperture 123. The actual quantity of fuel permitted to be delivered is not equal to that present in the fuel storing space 125, and we define the space containing the actual quantity to be the measuring space, rather than the fuel storing space 125. This measuring space is largely dependent upon the size of the fuel storing space 125.

In the second pit 110 parallel to the first pit 109, a flint holder 127 of cylindrical shape is provided, a flint 105 being housed therein and forced constantly toward the upper end of the pit 110 by a flint spring 128. On the upper portion of the flint holder 127, a sparking wheel 106 is located to rub against the flint 105.

The operating lever 107 is mounted on the upper portion of the block body 108, and it is normally biased by a lever spring 129 to a standstill position as shown in Figure 10.

In order to ignite a lighter, the operating lever 107 is forcibly pushed down and the sparking wheel 106 is rotated as shown in Figure 11. By this rotation, sparks are generated adjacent the burner nozzle 103. Movement of the operating lever 107 lifts the burner nozzle 103. This movement causes the inlet valve to

close, isolating the measuring space including the fuel storing space 125 from the reservoir 102, while the same movement also opens the outlet valve. When the outlet valve is opened as above, with reference to Figure 11, the fuel stored in the measuring space starts to move upwards through the burner nozzle 103 and nozzle aperture 123, and finally the fuel is ignited by the sparks. When the fuel stored in the measuring space is exhausted, the flame extinguishes itself because there is no further supply of fuel from the reservoir 102. In other words, the generated flame is maintained only for a limited time for the fixed quantity of fuel stored in the measuring space, and after the consumption of the fuel, the flame automatically dies out.

After cigarette ignition, the operating lever 107 is released, and the power of the lever spring 129 drives the lever 107 into the original position, whereon the burner nozzle 103 is lowered to its normal position and the outlet valve closes. At the same time, the lowering of the burner nozzle 103 results in the inlet valve opening whereon the measuring space again communicates with the reservoir 102 to permit fuel to flow freely through the aperture 111 to fill the measuring space ready for the succeeding ignition.

While the preferred embodiments of the present invention have been described, such description is for the purpose of illustration only and it is to be understood by those skilled in the art that changes and variations using refillable lighters or other different ignition mechanisms may be made without departing from the scope of the invention as defined by the following claims.

Claims

1. A pocket lighter characterised by a measuring chamber (21, 125) an inlet valve (19, 20, 117, 120) and an outlet valve (17, 23, 119, 124), the inlet and outlet valves (19, 20, 117, 120, 17, 23, 119, 124) being arranged such that opening of the outlet valve (17, 23, 119, 124) permitting fuel to flow from the measuring chamber (21, 125) results in the inlet valve (19, 20, 117, 120) being closed, and closing of the outlet valve (17, 23, 119, 124) results in the inlet valve (19, 20, 117, 120) being opened to permit fuel to flow into the measuring chamber (21, 125).
2. A pocket lighter as claimed in Claim 1, characterised by an operating lever (7, 107) for use in operating the pocket lighter.
3. A pocket lighter as claimed in Claim 1 or Claim 2, characterised by a movable valve body (12, 112) defining at least part of each of the inlet and outlet valves (19, 20, 117, 120, 17, 23, 119, 124).

4. A pocket lighter as claimed in Claim 3, characterised in that the valve body (12, 112) includes a burner nozzle (3, 103).
5. A pocket lighter as claimed in Claim 3 or Claim 4, characterised in that downward movement of the valve body (12) results in opening of the outlet valve (17, 23) and closing of the inlet valve (19, 20). 5
6. A pocket lighter as claimed in Claim 3 or Claim 4, characterised in that upward movement of the valve body (112) results in opening of the outlet valve (119, 124) and closing of the inlet valve (117, 120). 10 15
7. A pocket lighter as claimed in any one of Claims 4 to 6, characterised by an aperture (22) in said burner nozzle (3), and a shutter (29) mounted on an upper portion of the burner nozzle (3) for stopping emission of gas fuel from the aperture (22), said shutter (29) being adapted to move freely from a closing position to an opening position in response to operating lever (7) movement. 20 25
8. A pocket lighter as claimed in any one of Claims 2 to 7, characterised by a lighter body (1), wherein the operating lever (7) is slidably movable in a generally horizontal direction, in use, with respect to said lighter body (1), and wherein the operating lever (7) has a thruster (28) for forcing the valve body (12) to descend. 30
9. A pocket lighter as claimed in Claim 8, characterised by a sparking rasp (6) in plate form which is provided on the operating lever (7), said rasp (6) extending in the sliding direction of the lever (7), and wherein the rasp (6) moves substantially perpendicularly to a flint (5) for producing sparks. 35 40
10. A pocket lighter as claimed in any one of the preceding claims, characterised by a porous flow regulating member (34, 126) for regulating flow of gas fuel. 45 50 55

Fig. 1

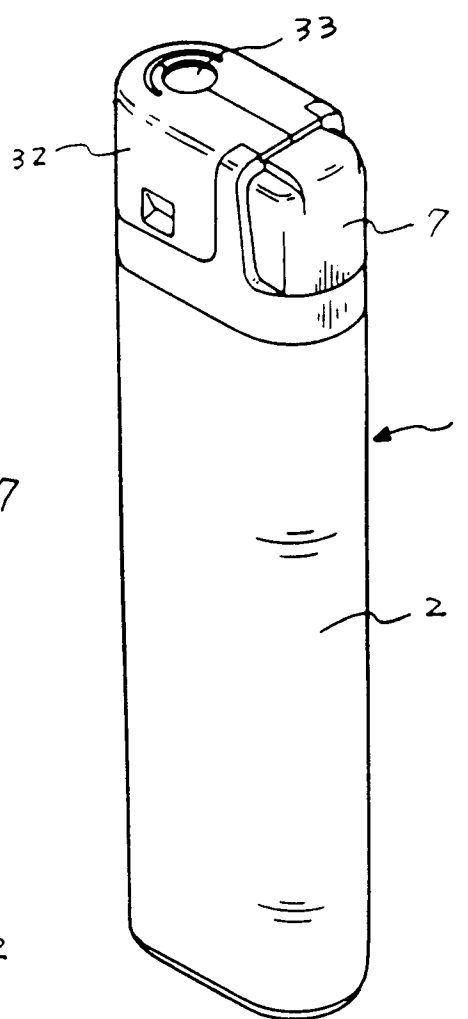


Fig. 2

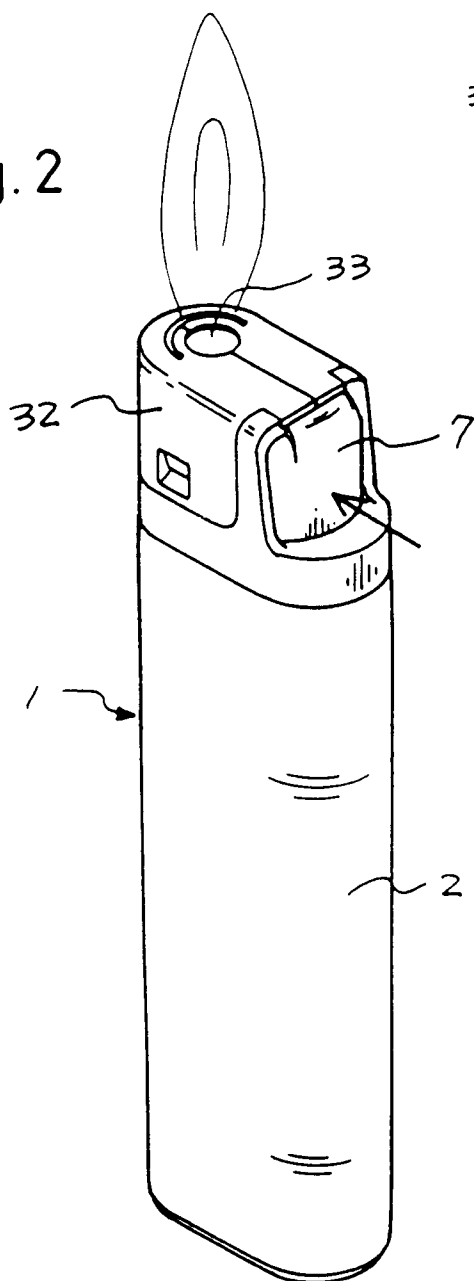


Fig. 3

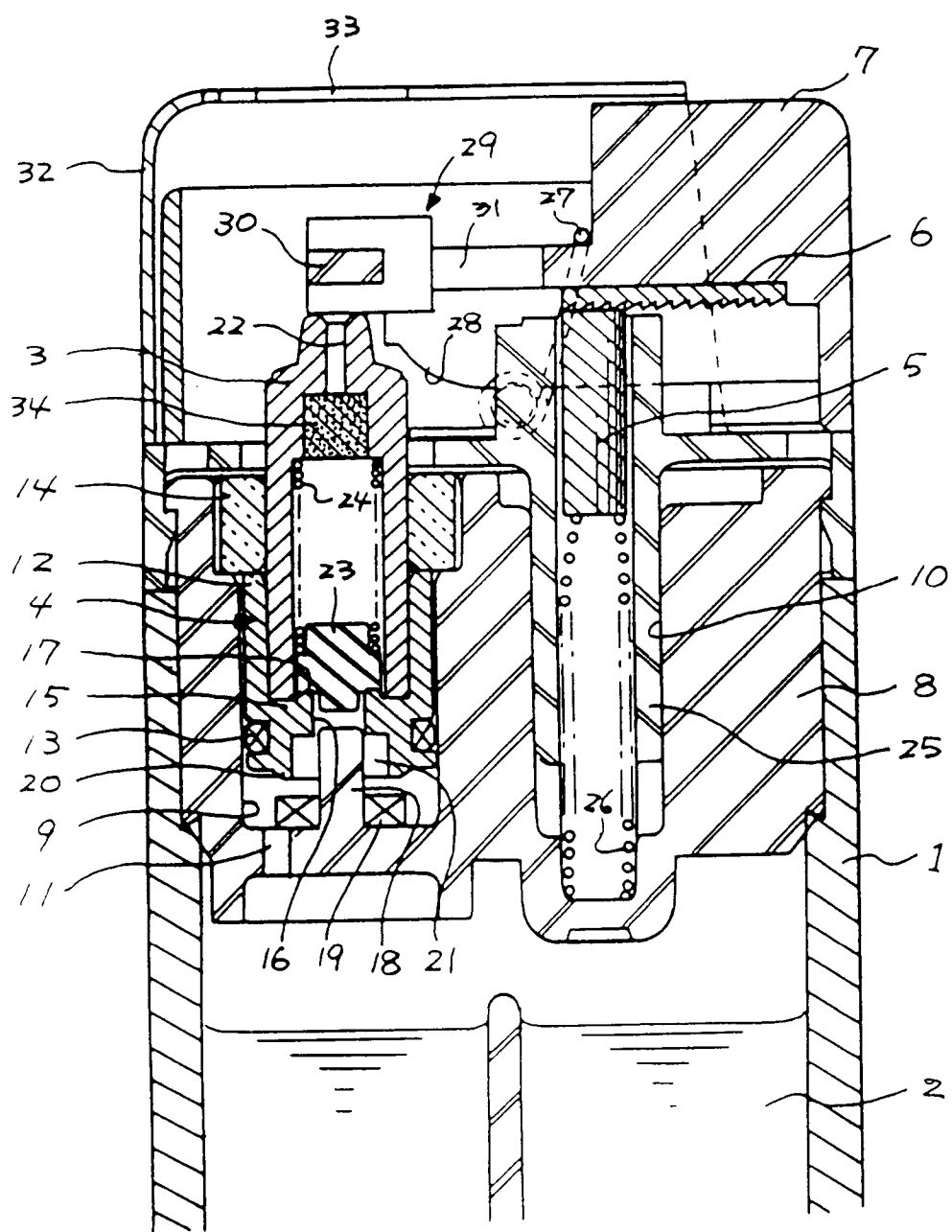


Fig.4

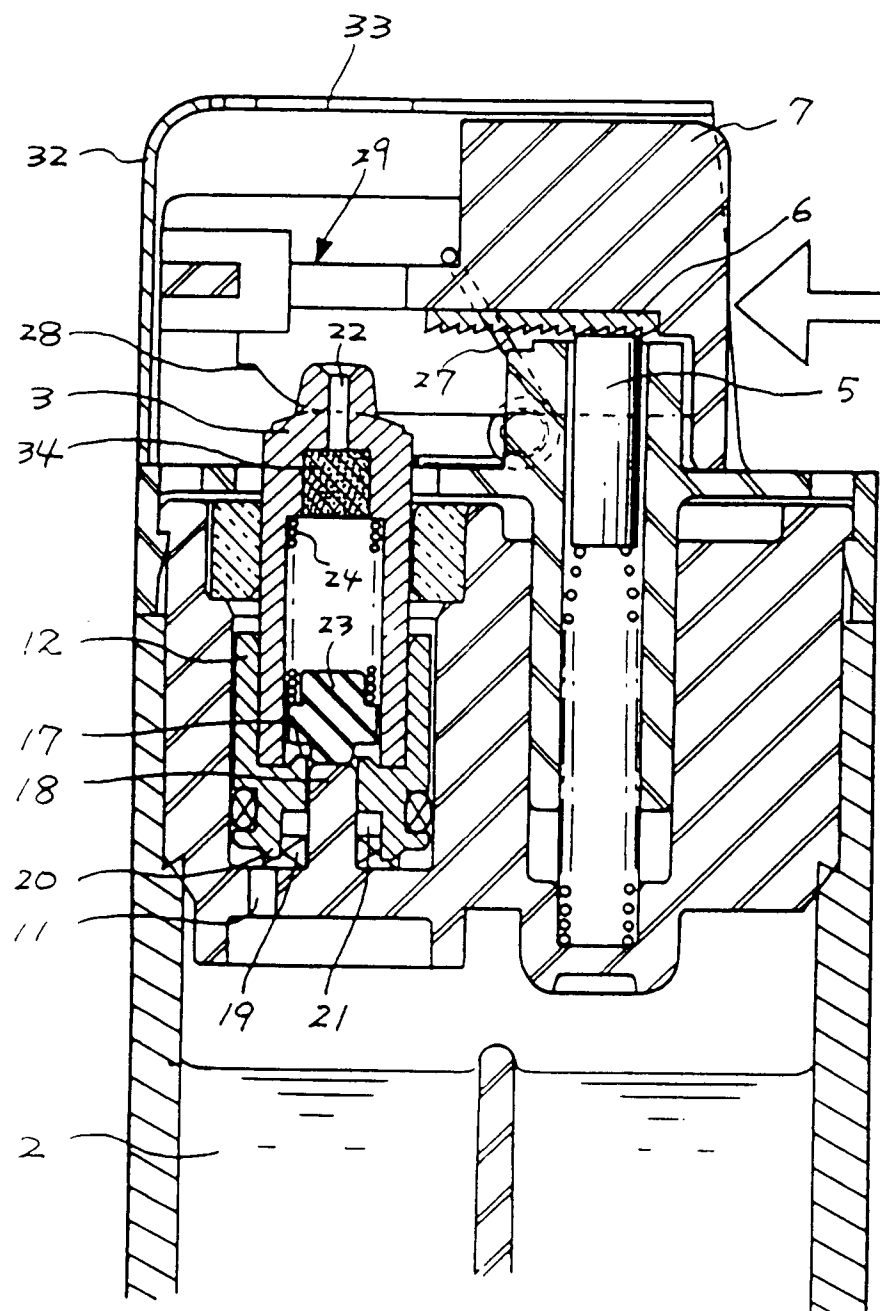


Fig.5

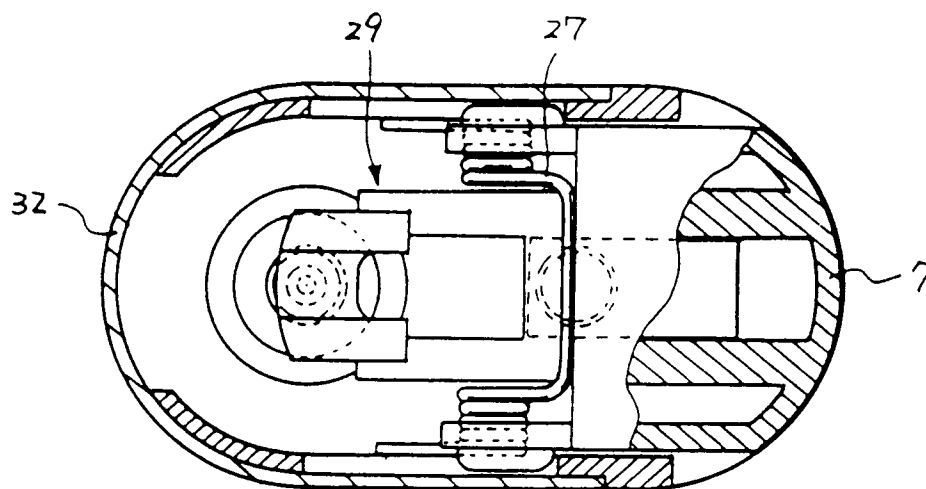


Fig.6

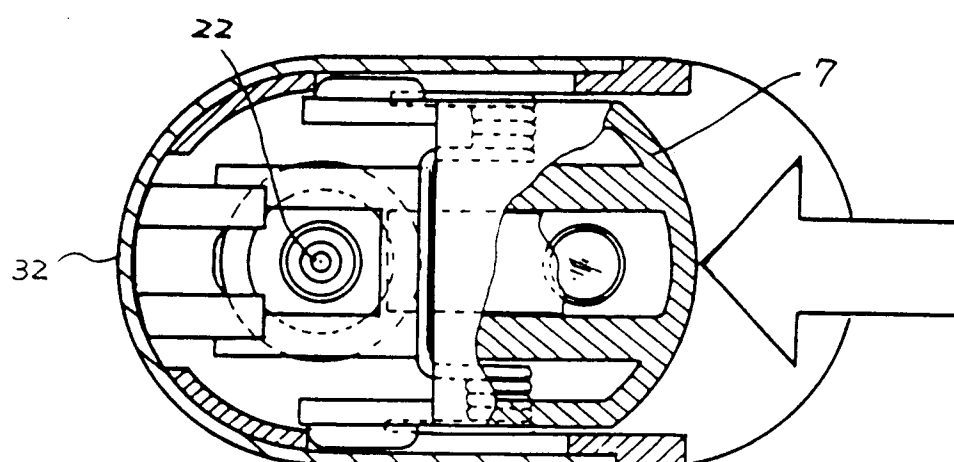


Fig. 7

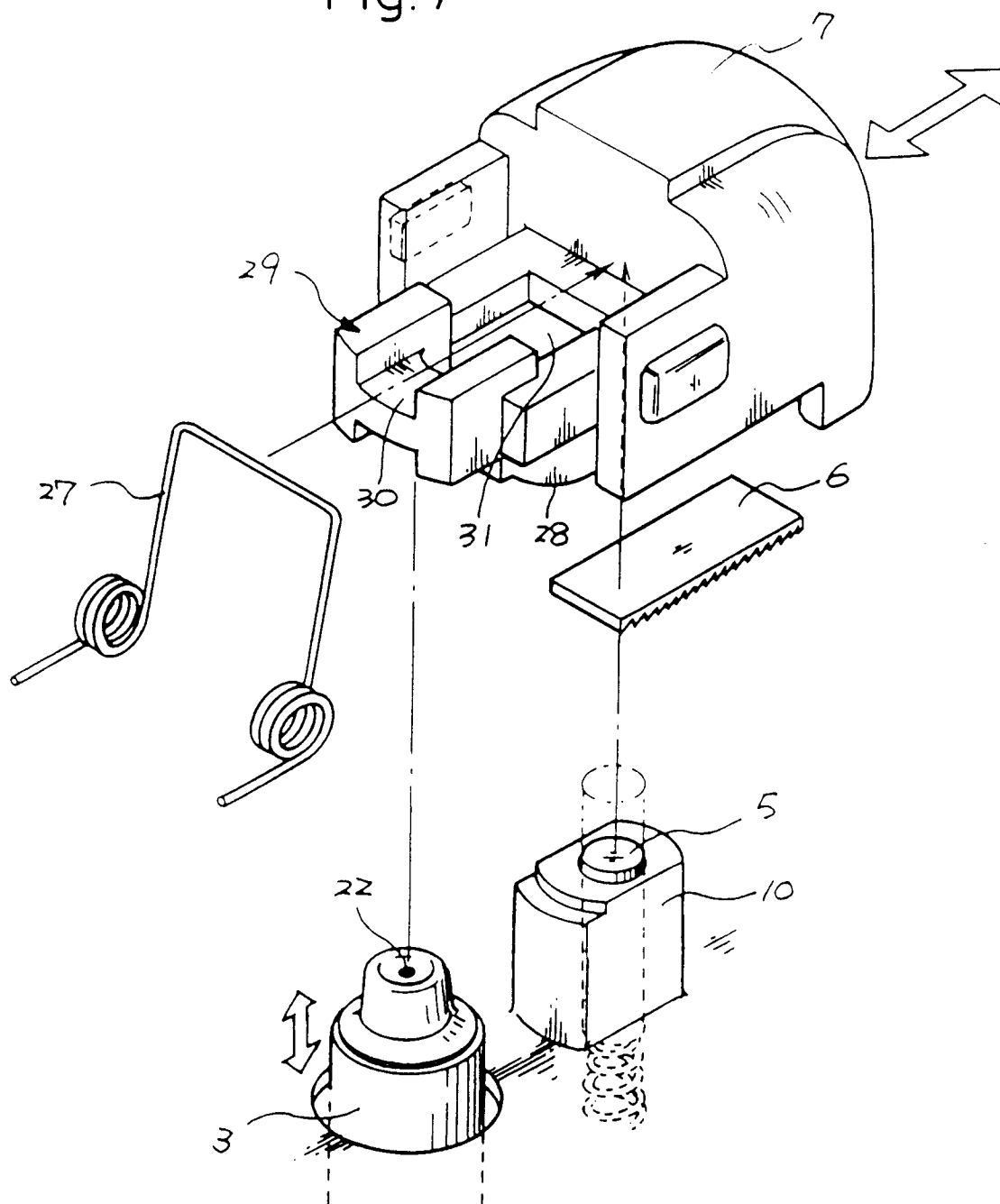


Fig.8

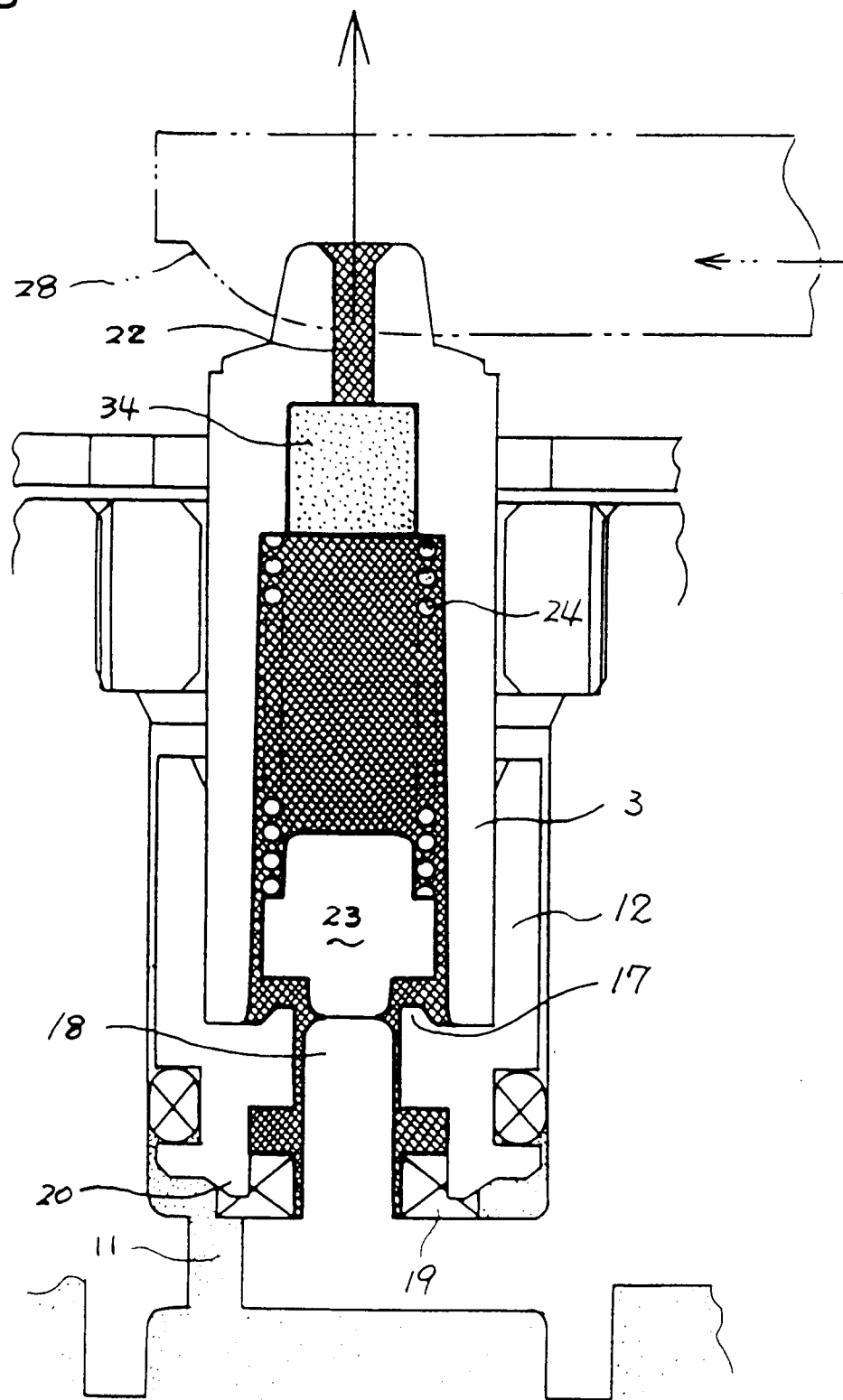


Fig. 9

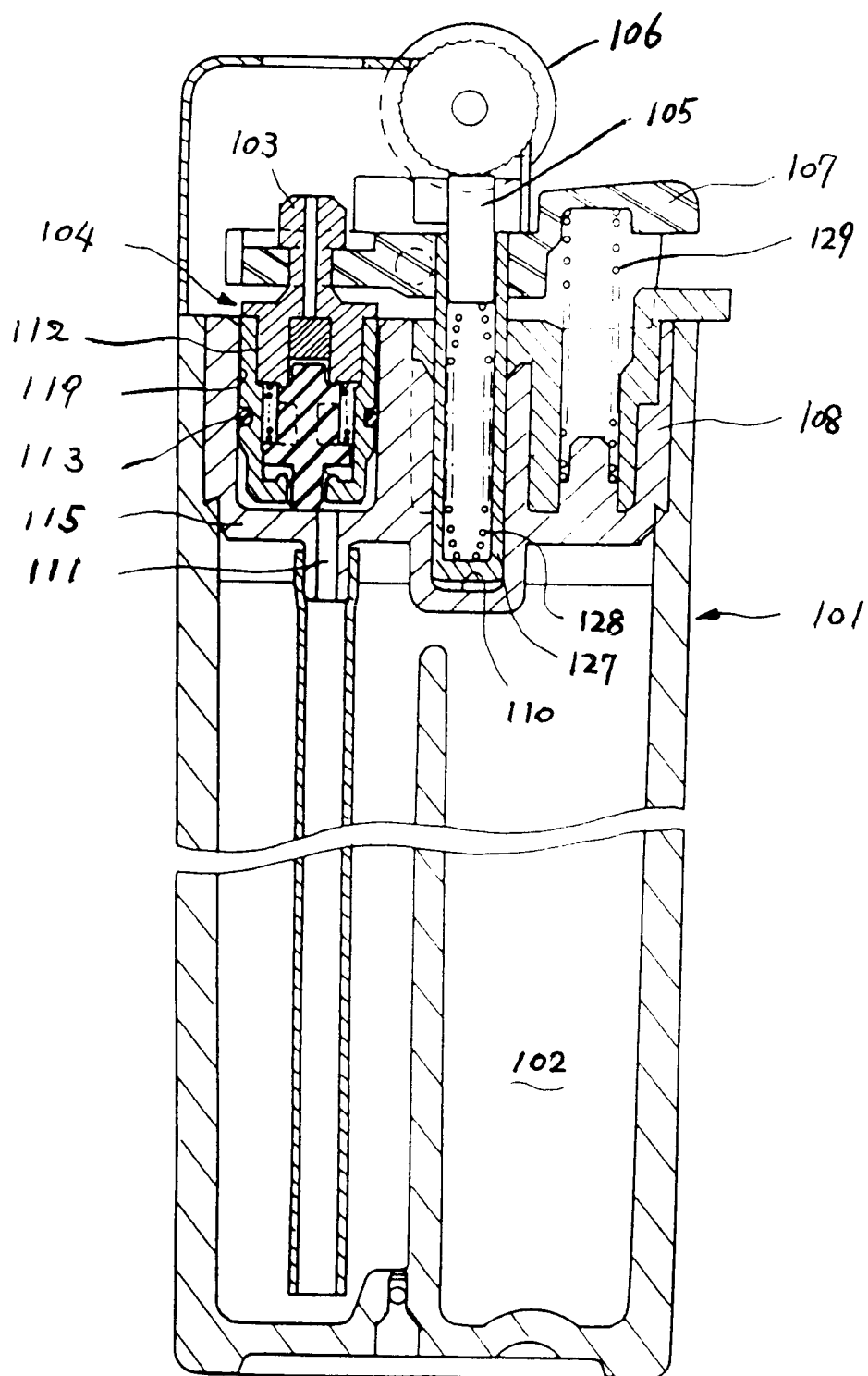


Fig.10

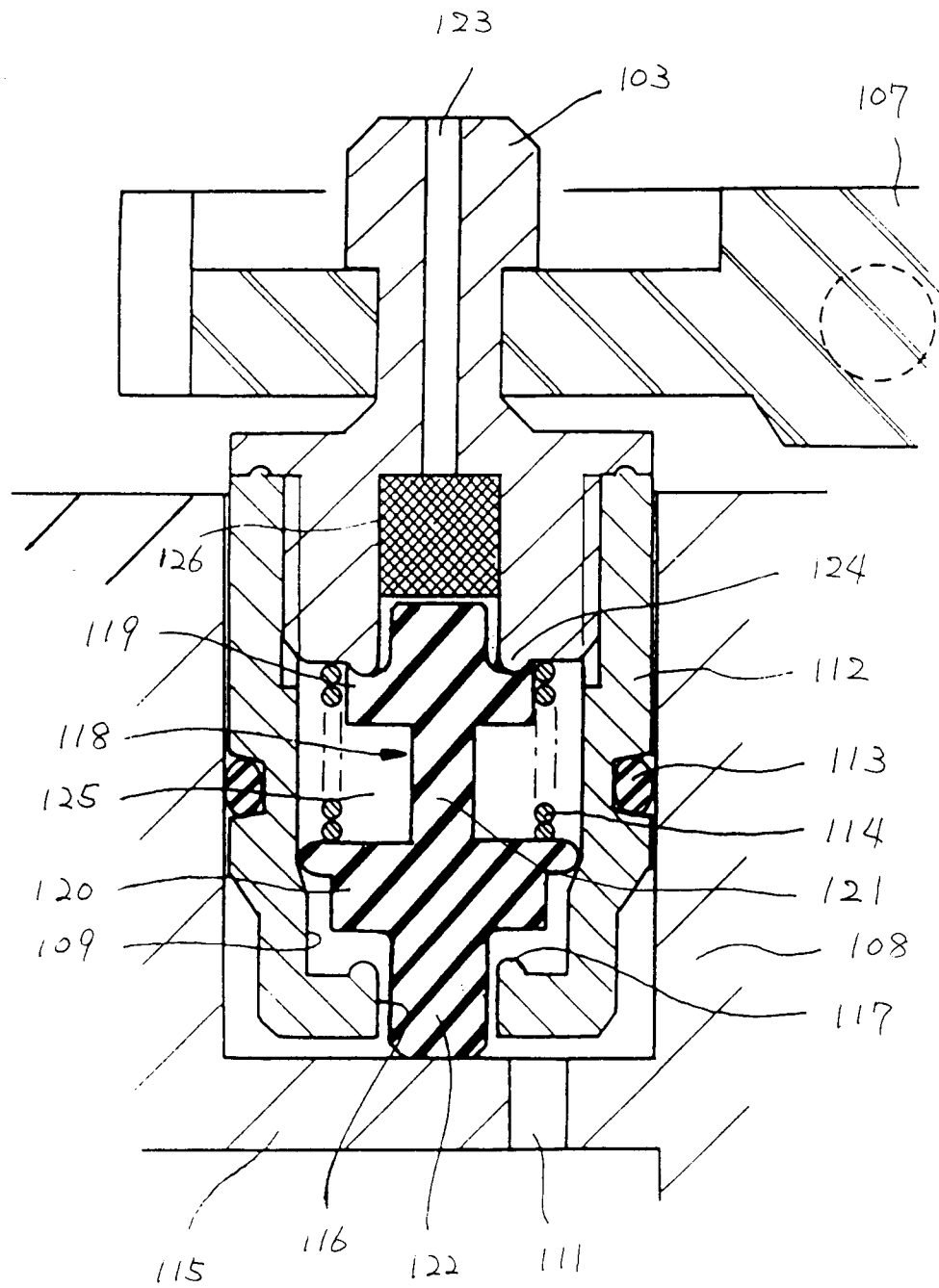


Fig.11

