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(54) **A child proof lighter**

(57) A childproof lighter with locker device provided inside the handle, including a movable frame located under the ignition trigger and above lever of the valve unit, which includes a vertical pole portion and a transverse pole, with the upper end of the vertical pole portion neighboring the top wall of the ignition trigger and the lower end neighboring the free end of the lever, and distal tip of head end of the transverse pole portion is comparatively thin and becomes thicker as it gets backward, and under natural status, the thinner portion of the head of the transverse pole portion is clamped between the piezoelectric bonnet of the piezoelectric unit and the protruding portion of the ignition trigger, so that stroke of the aforementioned movable frame is slightly smaller than the piezoelectric ignition stroke of the piezoelectric bonnet; a movable operating part that is fitted onto the handle and can make the above-mentioned movable frame to move toward the side of the piezoelectric unit; a compression spring which is fitted between the top end of the vertical pole portion and the inner side wall of the ignition trigger so as to maintain the movable frame in the backward position. With this invention, travel distance of piezoelectric bonnet is controlled through varying the thickness of the head end of the transverse pole portion fitted to the movable frame so that it can not be entirely pressed down and ignite under abnormal condition to completely prevent any hidden safety trouble.

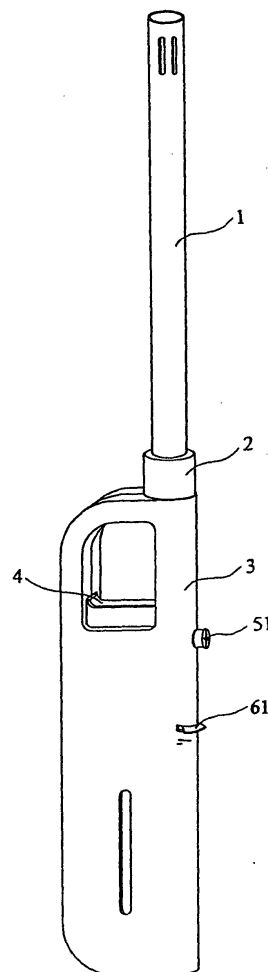


Fig.1

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Description

Field of invention

[0001] This present invention relates to a lighter, and more particularly to a childproof lighter fitted with locker device for preventing under age children from the usage of the lighter, ie, the lighter can not be ignited if the user just depress the ignition trigger in a normal way.

Description of related art

[0002] Conventional lighter comprises a handle for holding the lighter and an ignition tube extending outward from the top end of the handle, where a liquefied gas chamber and its valve unit, piezoelectric unit as well as an ignition trigger are provided inside the handle, and inside the liquefied gas chamber is filled with liquefied flammable gas, when depressing the ignition trigger, the gas valve opens, and in the meantime, the piezoelectric unit generates electric spark at the ignition tube tip through wire connection, consequently, if the ignition trigger keeps depressed, flame can be maintained at the ignition tube tip, this operation is very convenient indeed. Since the ignition tube of the lighter is extending outward and distancing itself from human hand that holds the handle, it is much safer than match, lighter and other kinds of igniter, and more flexible, that is why it is favored by many people and widely used on various kinds of occasions, for example, it is used in kitchen for igniting fuel gas kitchen range, for igniting bonfire when picnicking outside, for igniting birthday candles in a party, and so forth. However, it is because of its easy operability and its resembling to a toy in terms of its appearance, function and manner of usage, children are tend to play with it, causing unwanted accidental ignition and safety trouble.

[0003] Therefore, lighter with locker device was designed, early locker device was simply a lock switch having two positions, ie, "locking" and "unlocking" positions, when in locking position, the ignition trigger is locked and can not be depressed. However, many users usually forget to set the lock switch to its locking position after their usage, then, the lock switch will lose its function totally. And then, lighter with enhanced lock switch was designed to automatically reset its lock switch, ie, when the lighter is not used or after it is used, its lock switch is always kept in the locking position, this lighter is divided into two basic categories, ignition trigger is locked in the first category to prevent the trigger from being depressed accidentally, an example of such lighter is the scheme disclosed by US Patent US6126437; gas valve of the fuel gas chamber is locked in the other category so to prevent the gas valve from being opened in normal manner, an example of such lighter is the scheme disclosed by US Patent US6217313. The former imposes considerably high requirement on its manufacture and assembly, because if the lock switch

is not installed in right place, the ignition trigger might not be locked or the ignition trigger can not be depressed; with the latter, when the ignition trigger is depressed, it will always generate sparks at the ignition tube tip, although the gas valve is locked and fuel gas can not be supplied to the ignition tube tip, unexpected consequence might occur if there exists flammable substances around, moreover, if a child plays with and presses on the ignition trigger for a long time, service life of the piezoelectric unit installed inside will also be shortened.

Summary of the present invention

[0004] A main object of the present invention is to provide a childproof lighter for preventing under age children from using it, wherein the lighter is normally maintained in a locking position when left unused or after being used, and electric sparks will not be generated if only the ignition trigger is depressed due to accidentally operation.

[0005] Another object of the present invention is to provide a childproof lighter wherein the fuel gas valve will not emit flammable gas if only the ignition trigger is depressed due to accidental operation.

[0006] Accordingly, in order to accomplish the above objects, the following technical scheme is adopted: this childproof lighter comprises a handle for holding the lighter and an ignition tube extending outward, where a liquefied gas chamber and its valve unit as well as piezoelectric unit are provided in the handle and ignition trigger is fitted in the belly position of the handle and exposed from the handle, and is characterized in that a safety device is provided inside the handle, which includes the following:

[0007] A movable frame located under the ignition trigger and above lever of the valve unit, comprising a vertical pole portion and a transverse pole portion which are integrated, with the upper end of the vertical pole portion neighboring the top wall of the ignition trigger and the lower end neighboring the free end of the lever, and distal tip of head end of the transverse pole portion is comparatively thin and becomes thicker as it gets backward, and under natural status, the thinner portion of the head of the transverse pole portion is clamped between the piezoelectric bonnet of the piezoelectric unit and the protruding portion of the ignition trigger, so that stroke of the aforementioned movable frame is slightly smaller than the piezoelectric ignition stroke of the piezoelectric bonnet by which the piezoelectric unit could be ignited;

[0008] A movable operating part that moves the above movable frame toward the piezoelectric unit driven by human hand, which is exposed partially outside of the installation hole in correspondence with the handle.

[0009] A compression spring that is disposed between the top end of the vertical pole portion and the

inner side wall of the ignition trigger so as to maintain the movable frame in the backward position in natural status.

[0010] By comparing with the existing technology, this invention takes advantage of the principle that piezoelectric lighting requires the piezoelectric bonnet of the piezoelectric unit be depressed a certain stroke, which is controlled by the varying thickness of the head portion of the transverse pole portion of the movable frame so that it can not be pressed down in full stroke under abnormal igniting status, thereby, the lighter will not be damaged by a children who plays with it and keeps depressing the ignition trigger, moreover, by appropriate installation of properly shaped valve lever, the vertical pole portion of the movable frame will not be able to press down the free end of the lever even if it is wrongly operated, and the gas valve can not emit gas, thus completely preventing safety trouble from occurring.

Brief description of the drawings

[0011]

Fig. 1 is an exploded perspective view of a childproof lighter according to the first preferred embodiment of the present invention.

Fig. 2 is a partially sectional view of the childproof lighter according to the first preferred embodiment of the present invention, illustrating ignition trigger 4 not being depressed and push button 51 not being pushed in.

Fig. 3 is a partially sectional view of the childproof lighter according to the first preferred embodiment of the present invention, illustrating ignition trigger 4 being depressed and push button 51 not being pushed in.

Fig. 4 is a partially sectional view of the childproof lighter according to the first preferred embodiment of the present invention, illustrating ignition trigger 4 not being depressed and push button 51 being pushed in.

Fig. 5 is a partially sectional view of the childproof lighter according to the first preferred embodiment of the present invention, illustrating ignition trigger 4 being depressed and push button 51 being pushed in.

Fig. 6 is an exploded perspective view of the safety device according to the first preferred embodiment of the present invention.

Fig. 7 illustrates a variation of the safety device according to the first preferred embodiment of the present invention.

Fig. 8 is an exploded perspective view of a childproof lighter according to the second preferred embodiment of the present invention.

Fig. 9 is a partially sectional view of the childproof lighter according to the second preferred embodiment of the present invention, illustrating ignition

trigger 4 not being depressed and pusher button 52 not being pushed down.

Fig. 10 is a partially sectional view of the childproof lighter according to the second preferred embodiment of the present invention, illustrating ignition trigger 4 being depressed and pusher button 52 being pushed down.

Fig. 11 is an exploded perspective view of the safety device according to the second preferred embodiment of the present invention.

Fig. 12 is an exploded perspective view of a childproof lighter according to the third preferred embodiment of the present invention.

Fig. 13 is a partially sectional view of the childproof lighter according to the third preferred embodiment of the present invention, illustrating ignition trigger 4 not being depressed and push button 53 not being pushed toward the belly portion of the handle.

Fig. 14 is a partially sectional view of the childproof lighter according to the third preferred embodiment of the present invention, illustrating ignition trigger 4 being depressed and push button 53 being pushed toward the belly portion of the handle.

Fig. 15 is an exploded perspective view of the safety device according to the third preferred embodiment of the present invention.

Fig. 16 is an exploded perspective view of a childproof lighter according to the fourth preferred embodiment of the present invention.

Fig. 17 is a partially sectional view of the childproof lighter according to the fourth preferred embodiment of the present invention, illustrating ignition trigger 4 not being depressed and the upper end of the exposed vertical pole portion not being pushed toward the belly portion of the handle.

Fig. 18 is a partially sectional view of the childproof lighter according to the fourth preferred embodiment of the present invention, illustrating ignition trigger 4 being depressed and the upper end of the exposed vertical pole portion being pushed toward the belly portion of the handle.

Fig. 19 is an exploded perspective view of the safety device according to the fourth preferred embodiment of the present invention.

Detailed description of the preferred embodiment

[0012] The following is a further detailed description of the present invention by illustrating preferred embodiments and by referring to the drawings attached therein.

[0013] Referring to Figs 1 through 6 of the drawings, the first preferred embodiment of the present invention comprises a handle 3 and an extended ignition tube 1, where handle 3 comprises two split casings and the extended ignition tube 1 is fixed to the protruding portion 31 on top end of the handle 3 by fixing sleeve;

[0014] Inside handle 3 are provided the gas chamber 6 and its valve unit 63 as well as piezoelectric unit 9,

while ignition trigger 4 is disposed in the belly position of handle 3 and is exposed out of handle 3, and a safety device is provided inside handle 3, including:

A safety push button 5 disposed at the back of handle 3, the tail portion of which is exposed out the installation hole 32 (refer to Fig. 6) corresponding with handle 3;

A movable frame 8 located under ignition trigger 4 and above lever 62 of the valve unit 63 with the upper end of its vertical pole portion81 neighboring the top wall of the ignition trigger and its lower end neighboring the free end 62a of the lever 62, moreover, lever 62 has a recess in a position corresponding with the lower end of above vertical pole portion81; the head end of transverse pole portion82 has a convex 82b having a bevel at its front end, which forms a thinner front end 82a and thicker rear end with a convex 82b; and in natural status, the thinner portion 82a of the head portion of the transverse pole portion is clamped between the piezoelectric bonnet 91 of the piezoelectric unit 9 and the middle protruding portion 42 of the ignition trigger, and transverse pole portion82 has a folded side portion 82c on its head, which comes into contact with the aforementioned safety push button 51; two small protrusions 41 and 45 provided on the inner wall of the said ignition trigger in a position corresponding with the back of transverse pole portion82 of the said movable frame to form a guiding channel, moreover, another small protrusion 43 is also provided on the inner wall of the said ignition trigger in the middle protruding portion 42 of the ignition trigger, thus, another guiding channel is formed on the same straight line;

A compression spring 7 disposed between the upper end of transverse pole portion81 and inner side-wall of ignition trigger 4, which in natural status, forces the movable frame 8 in backward status and makes the safety push button 51 protruding out of the handle 3.

[0015] The said handle 3 is fitted with a protruding stopper 33 on its inner wall in a position corresponding with ignition trigger bottom 44, and the distance between them is slightly smaller than the piezoelectric igniting stroke of the piezoelectric bonnet 91 of the piezoelectric unit.

[0016] In the figure, item 61 is the flame adjusting button, items 93 and 92 are wires respectively connecting positive pole and negative pole of the piezoelectric unit 9, and other ends of these two wires extend up to the tip of ignition tube 1 (not shown in the figure); in Figure 6, item 46 is the side panel of ignition trigger 4.

[0017] At use, when the safety push button 51 is not pushed into handle 3, that is, in natural status, only the comparatively thin portion 82a of head end of the transverse pole portion82 of the movable frame 8 is clamped

between the piezoelectric bonnet 91 of the piezoelectric unit 9 and the middle protruding portion 42 of the ignition trigger, when, if ignition trigger 4 is depressed until its bottom end 44 is retained by the stopper 33 on the handle 3, the piezoelectric bonnet 91 still reach the piezoelectric ignition stroke, and the piezoelectric unit 9 will not ignite, and in the meantime, the lower end of the vertical pole portion81 of the movable frame 8 happened to extend the lower recess of lever 62, therefore, lever 62 will not act or act with insufficient amplitude, and gas valve 63 still remains in close status;

[0018] When the safety push button 5 is depressed into the handle, the thicker portion 82b of head end of the transverse pole portion82 of the movable frame 8 is inserted between the piezoelectric bonnet 91 of the piezoelectric unit 9 and the middle protruding portion 42 of the ignition trigger, to allow the piezoelectric bonnet 91 to have an advance stroke, then, if the ignition trigger 4 is depressed, the piezoelectric bonnet 91 will reach an ignition stroke causing the piezoelectric unit 9 to ignite, and allow electric sparks to be generated by the spark generating components (not shown in the figure) fitted at the ignition tube tip through connecting wire 92 (ground wire) and 93 (positive pole); in the meantime, the lower end of vertical pole portion81 of the movable frame depresses the free end 62a of the lever 62, causing the gas valve 63 to open, and deliver gas to the tip of ignition tube 1 through gas pipe 64, which generates flame when meeting electric sparks.

[0019] The above safety device may have a slight variation as shown in Fig. 7, a short transverse pole portion83 may be provided on the vertical pole portion81 on the side far away from the piezoelectric unit to run parallel with the transverse pole portion82 so as to increase the strength, then, the folded side 82c of the tail end of the previous transverse pole portion82 also changes into short vertical pole portion84 connecting transverse pole portion82 and short transverse pole portion83; a protruding pillar 83a is provided under the tail end of the short transverse pole portion83, and a stopper 34 (refer to Figures 9 and 10) is provided on the inner wall of handle 3 in a corresponding position, so that in igniting status, this pillar 83a comes in contact with stopper 34, locking the movable frame 8 in fixed position without backing up, thereby reversion force of the compression spring 7 is overcome, thus, reducing finger pressing force on the push button 51. In this time, the previous position locking between the convex 82b at front end of transverse pole portion82 and the small protrusion 43 on the inner wall of ignition trigger is no longer needed, therefore, the previous convex 82b at front end of transverse pole portion82 may change into a simple bevel, which makes the manufacture easier (refer to Fig. 7). In order to limit the position of compression spring 7, a protruding pillar 81a may be provided on the vertical pole portion81 on the side opposite to the compression spring 7, which is fixed on the said pillar 81a.

[0020] As shown in Figures 8 through 11, in the second preferred embodiment of the present invention, the difference if compared with the first preferred embodiment of the present invention is that a pusher button 52 is used to replace the previous push button 51, whose head end 52a has a center recess that is intended to press against the tail end of transverse pole portion 82 of the movable frame (where the short vertical pole portion 84 is slightly different when compared with Figure 7), and there is a gradual change between the center recess portion and protruding portion above, the tail end 52b of the pusher button 52 being exposed out of the installation hole corresponding with the handle.

[0021] For igniting, the pusher button 52 is pushed downward along the back of the handle, and the short vertical pole portion 84 at the tail end of the movable frame then changes from previously pressing against the center recess of the head portion 52a of the pusher button to pressing against its upper bevel surface, finally, pressing against the top convex of the head portion 52a of the pusher button, during which, the entire movable frame 8 moves towards the piezoelectric unit, so that the thicker portion of head end of transverse pole portion 82 of the movable frame 8 is inserted between the piezoelectric bonnet 91 of the piezoelectric unit 9 and the middle protruding portion 42 of the ignition trigger, to allow the piezoelectric bonnet 91 to have an advance stroke, then, if the ignition trigger 4 is depressed, the piezoelectric bonnet 91 will reach an ignition stroke causing the piezoelectric unit 9 to ignite, and allow electric sparks to be generated by the spark generating components (not shown in the figure) fitted at the ignition tube tip through connecting wire 92 (ground wire) and 93 (positive pole); in the meantime, the protruding pillar 83a fitted on the short transverse pole portion 83 is also pressing against the stopper 34 (refer to Fig. 10), at this time, the movable frame 8 would not move toward the back of the handle even if pusher button 52 is pushed upward, so that users can easily operate the lighter for lighting purpose; in the meantime, the lower end of vertical pole portion 81 of the movable frame depresses the free end 62a of the lever 62, causing the gas valve 63 to open, and deliver gas to the tip of ignition tube 1 through gas pipe 64, which generates flame when meeting electric sparks.

[0022] As shown in Figures 12 through 15, in the third preferred embodiment of the present invention, the difference if compared with the first preferred embodiment of the present invention is that a push button 53 is used to replace the previous push button 51, whose head end is a protruding pillar 53a (refer to Fig. 15), which inside the handle, is just behind the protruding pillar 81b corresponding with vertical pole portion 81 of the movable frame (refer to Figures 15 and 13), and the tail end of the push button is exposed out of the installation hole corresponding with the handle (refer to Fig. 12).

[0023] For igniting, push button 51 is pushed along the side wall of the handle toward the direction of the

belly of the handle, and the protruding pillar 51a of the head portion of push button 51 will drive the protruding pillar 81b on the movable frame, causing the entire movable frame 8 to move toward the piezoelectric unit, and the thicker portion 82b of head end of the transverse pole portion 82 of the movable frame 8 is inserted between the piezoelectric bonnet 91 of the piezoelectric unit 9 and the middle protruding portion 42 of the ignition trigger, to allow the piezoelectric bonnet 91 to have an advance stroke, then, if the ignition trigger 4 is depressed, the piezoelectric bonnet 91 will reach an ignition stroke causing the piezoelectric unit 9 to ignite, in the meantime, the protruding pillar 83a fitted on the short transverse pole portion 83 is also pressing against the stopper 34 (refer to Fig. 10), at this time, the movable frame 8 would not move toward the back of the handle even if push button 51 is released, so that users can easily operate the lighter for lighting purpose; in the meantime, the lower end of vertical pole portion 81 of the movable frame depresses the free end 62a of the lever 62, causing the gas valve 63 to open, and deliver gas to the tip of ignition tube 1 through gas pipe 64, which generates flame when meeting electric sparks.

[0024] In the above preferred embodiment, the vertical pole portion 81 of the movable frame can also be made the same height as its protruding pillar 81b forming a comparatively thick wall, so that the protruding pillar 51a of the head portion of push button 51 is behind it, and that when igniting, the protruding pillar 51a of the head portion of push button 51 will drive the entire vertical pole portion 81, such variation making assembly easier.

[0025] As shown in Figures 16 through 19, in the fourth preferred embodiment of the present invention, the difference if compared with the first preferred embodiment of the present invention is that upper end of vertical pole portion 81 of the movable frame exposed out side of upper end of the ignition trigger 4 is directly used in place of push button 51, and a narrow hole 47 is provided on the upper end surface of the ignition trigger 4, the upper end of vertical pole portion 81 goes through the above narrow hole 47 and is exposed out side of the ignition trigger 4, and under natural status of compression spring 7, upper end of vertical pole portion 81 is located in the narrow hole 47 on the side nearing the back of the handle.

[0026] For igniting, when the upper end of vertical pole portion 81 is pushed toward the belly of the handle, the movable frame 8 also moves along with it toward the side of the piezoelectric unit, the thicker portion of head end of the transverse pole portion 82 of the movable frame 8 is inserted between the piezoelectric bonnet 91 of the piezoelectric unit 9 and the middle protruding portion 42 of the ignition trigger, to allow the piezoelectric bonnet 91 to have an advance stroke, then, if the ignition trigger 4 is depressed, the piezoelectric bonnet 91 will reach an ignition stroke causing the piezoelectric unit 9 to ignite, in the meantime, the protruding pillar 83a fitted

on the short transverse pole portion 83 is also pressing against the stopper 34 (refer to Fig. 10), at this time, the movable frame 8 would not move toward the back of the handle even if the upper end of vertical pole portion 81 is released, so that users can easily operate the lighter for lighting purpose; in the meantime, the lower end of vertical pole portion 81 of the movable frame 8 depresses the free end 62a of the lever 62, causing the gas valve 63 to open, and deliver gas to the tip of ignition tube 1 through gas pipe 64, which generates flame when meeting electric sparks.

Claims

1. A childproof lighter, comprising a handle for holding the lighter and an ignition tube extending outward, where a liquefied gas chamber and its valve unit as well as piezoelectric unit are provided in the handle and ignition trigger is fitted in the belly position of the handle and exposed from the handle, and is **characterized in that** a safety device is provided inside the handle, which includes the following:

A movable frame located under the ignition trigger and above lever of the valve unit, comprising a vertical pole portion and a transverse pole portion which are integrated, with the upper end of the vertical pole portion neighboring the top wall of the ignition trigger and the lower end neighboring the free end of the lever, and distal tip of head end of the transverse pole portion is comparatively thin and becomes thicker as it gets backward, and under natural status, the thinner portion of the head of the transverse pole portion is clamped between the piezoelectric bonnet of the piezoelectric unit and the protruding portion of the ignition trigger, so that stroke of the aforementioned movable frame is slightly smaller than the piezoelectric ignition stroke of the piezoelectric bonnet by which the piezoelectric unit could be ignited;

A movable operating part that moves the above movable frame toward the piezoelectric unit driven by human hand, which is exposed partially outside of the installation hole in correspondence with the handle.

A compression spring that is disposed between the top end of the vertical pole portion and the inner side wall of the ignition trigger so as to maintain the movable frame in the backward position in natural status.

2. A childproof lighter according to the claim 1, wherein the said movable operating part is a push button located on the back of the handle, whose head portion presses against the tail end of the transverse pole portion of the movable frame, with its tail end

exposing out of the installation hole corresponding with the handle.

3. A childproof lighter according to the claim 1, wherein the said movable operating part is a pusher button that is located on the back of the handle and is movable in up and down direction in correspondence with the handle, whose head end has a center recess that is intended to press against the tail end of transverse pole portion of the movable frame, and the tail end of the pusher button being exposed out of the installation hole corresponding with the handle, and there is a gradual change between the said center recess portion and the neighboring protruding portion, the pusher button shall drive the transverse pole portion of the movable frame forward while it being moved up and down.
4. A childproof lighter according to the claim 1, wherein the said movable operating part is a push button that is located on the side of the handle and is movable in left and right direction in correspondence with the handle, whose head end is a protruding pillar inside the handle and being located behind the vertical pole portion of the movable frame, which could drive the vertical pole portion forward, and the tail end of the push button being exposed out of the installation hole corresponding with the handle.
5. A childproof lighter according to the claim 1, wherein the said movable operating part is the upper end of the vertical pole portion of the movable frame that extends out of upper end of the said ignition trigger.
6. A childproof lighter according to any one of the claims 1 through 5, wherein the said handle is fitted with a protruding stopper on its inner wall in a position corresponding with ignition trigger bottom, and the distance between them is slightly smaller than the piezoelectric igniting stroke of the piezoelectric bonnet of the piezoelectric unit by which the piezoelectric unit could be ignited.
7. A childproof lighter according to any one of the claims 1 through 5, wherein two small protrusions are provided on the inner wall of the said ignition trigger in a position corresponding with the back of transverse pole portion of the said movable frame to form a guiding channel.
8. A childproof lighter according to any one of the claims 1 through 5, wherein the lever of the said gas valve unit has a downward recess in a position corresponding with the lower end of the vertical pole portion of the said movable frame.
9. A childproof lighter according to any one of the claims 1 through 5, wherein a short transverse pole

portion is provided on the side of the vertical pole, the said side being far away from the piezoelectric unit to run parallel with the transverse pole, a protruding pillar is provided under the tail end of the short transverse pole, and a stopper is provided on the inner wall of handle in a corresponding position, so that in igniting status, this pillar comes in contact with stopper, locking the movable frame in fixed position without backing up.

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10. A childproof lighter according to any one of the claims 1 through 5, wherein a protruding pillar is provided on the vertical pole portion of the said movable frame, on the side opposite to the compression spring, the said spring is fixed on the said protruding pillar.

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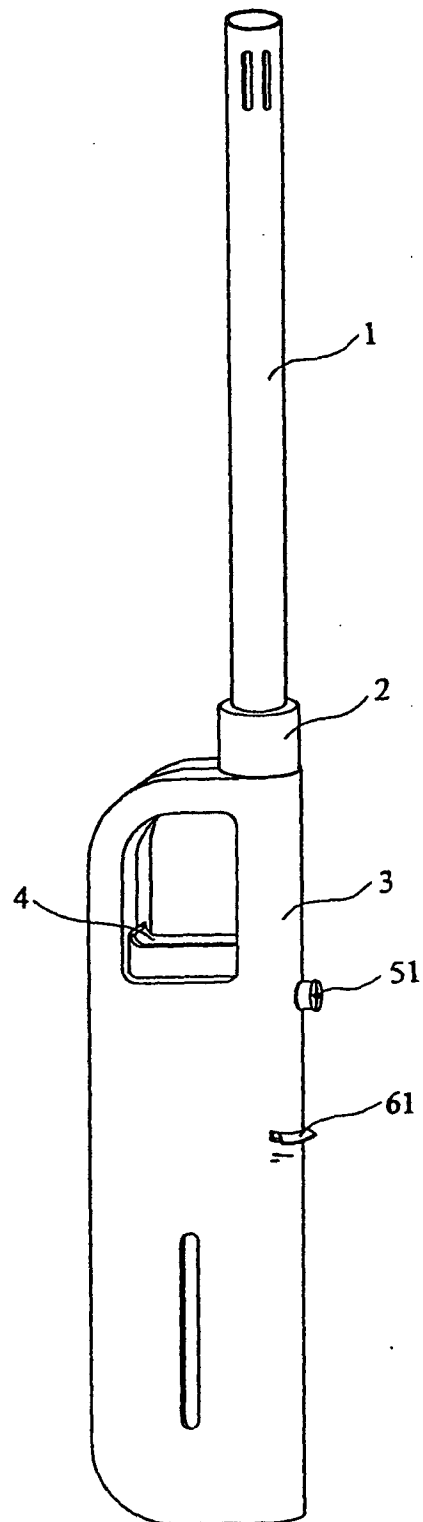


Fig.1

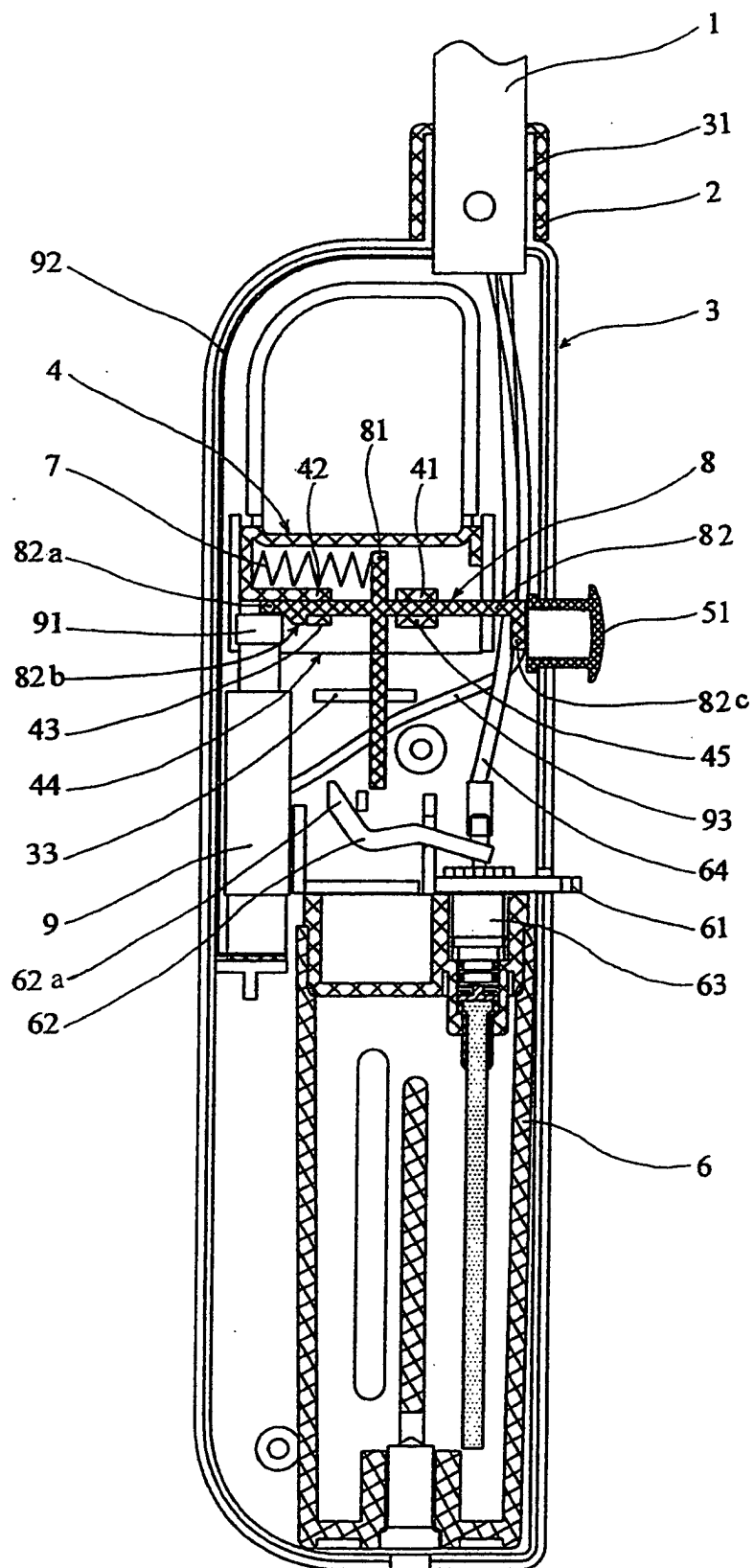


Fig.2

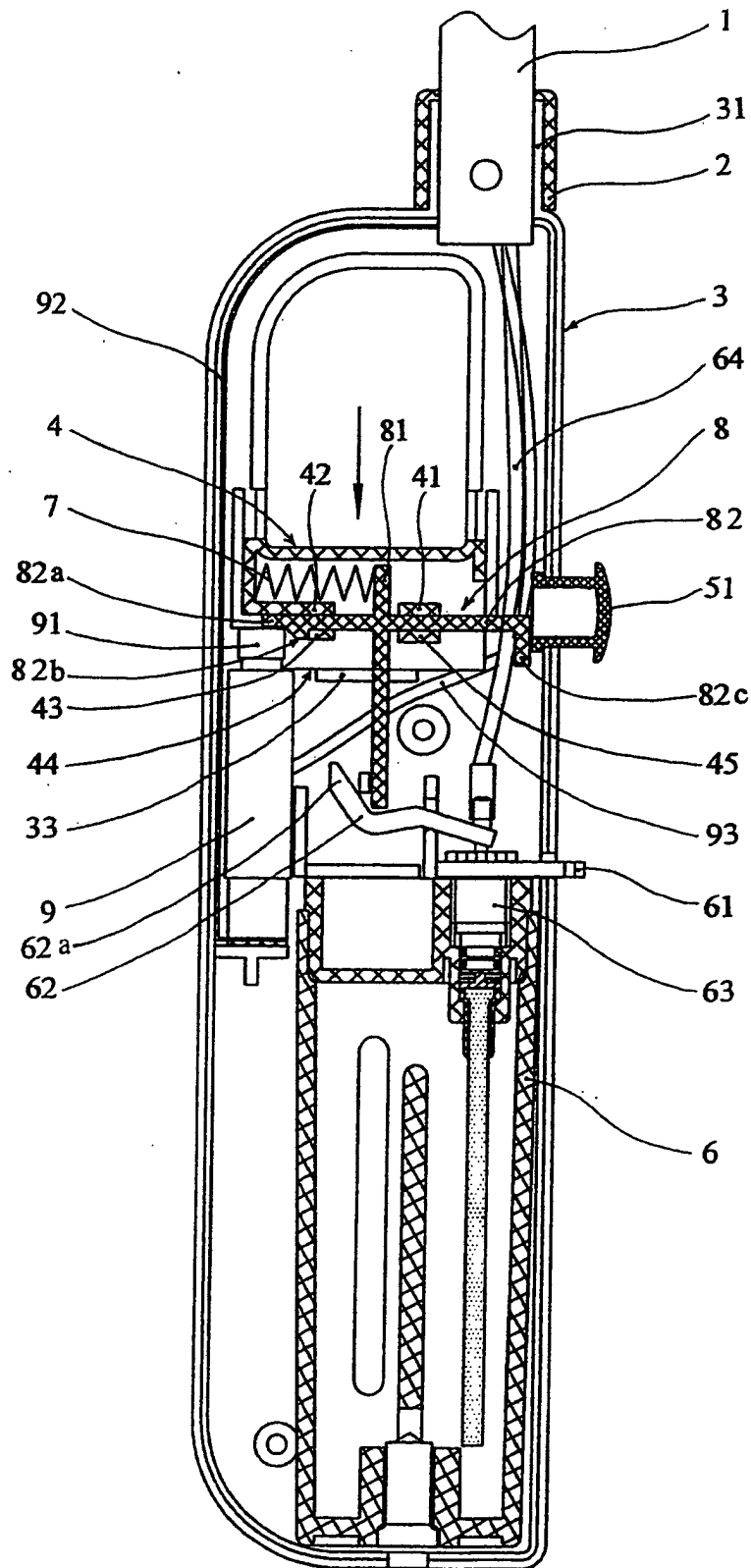


Fig.3

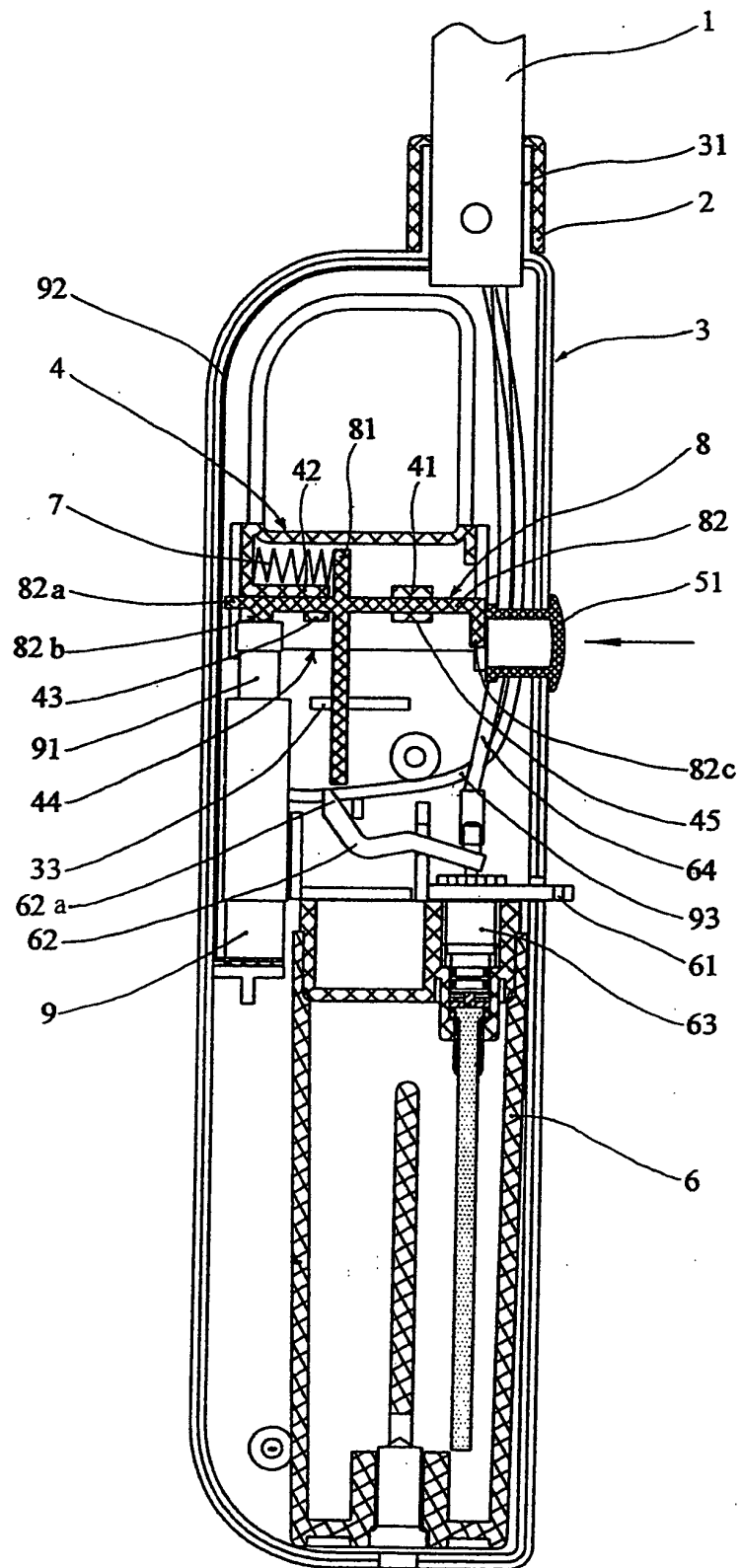


Fig.4

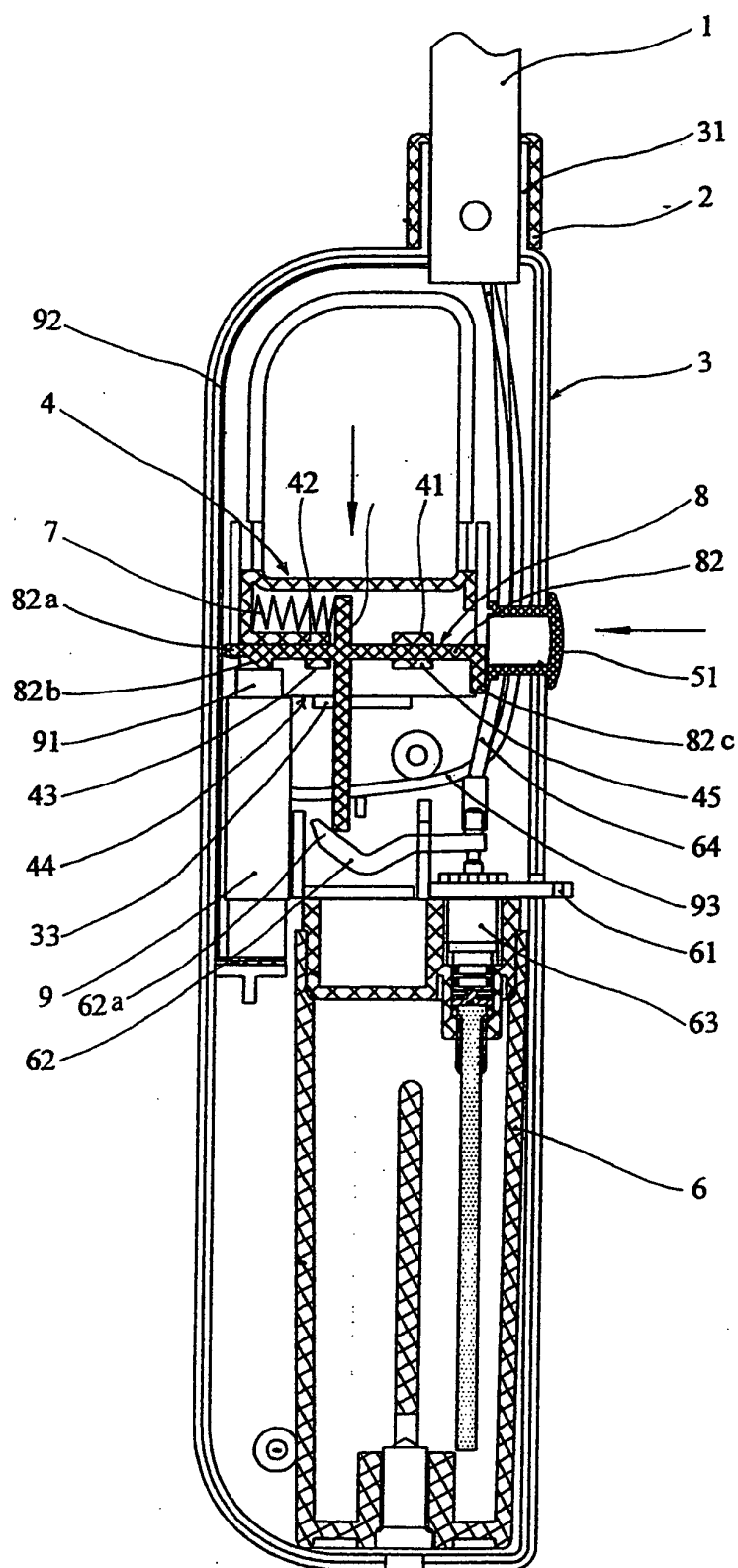


Fig.5

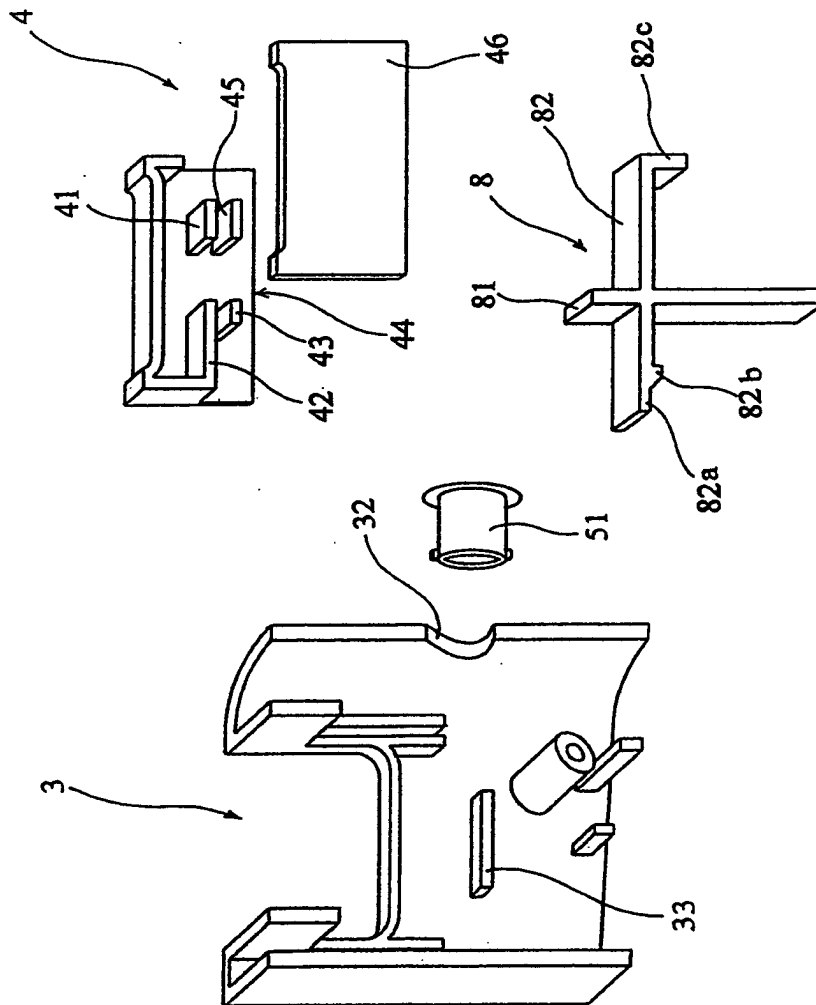


Fig.6

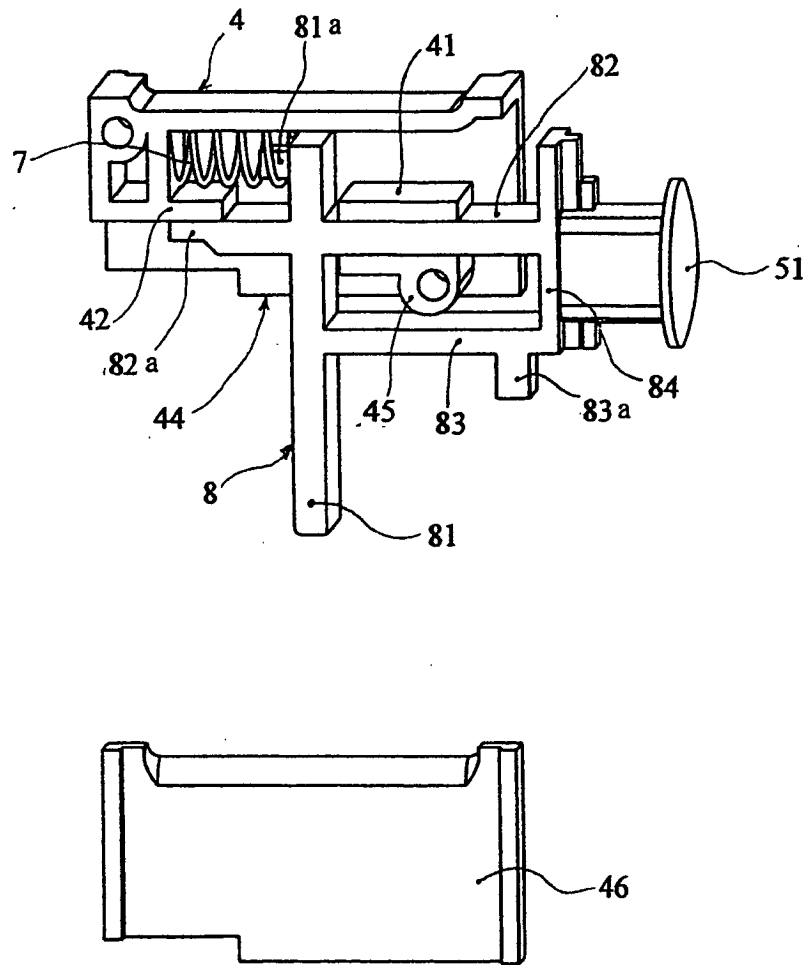


Fig.7

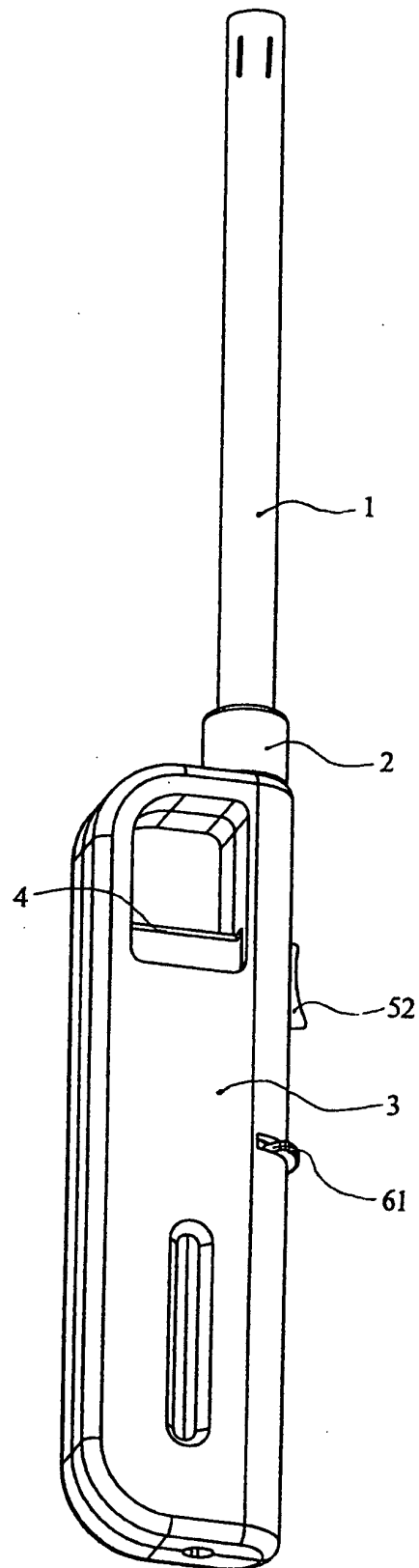


Fig.8

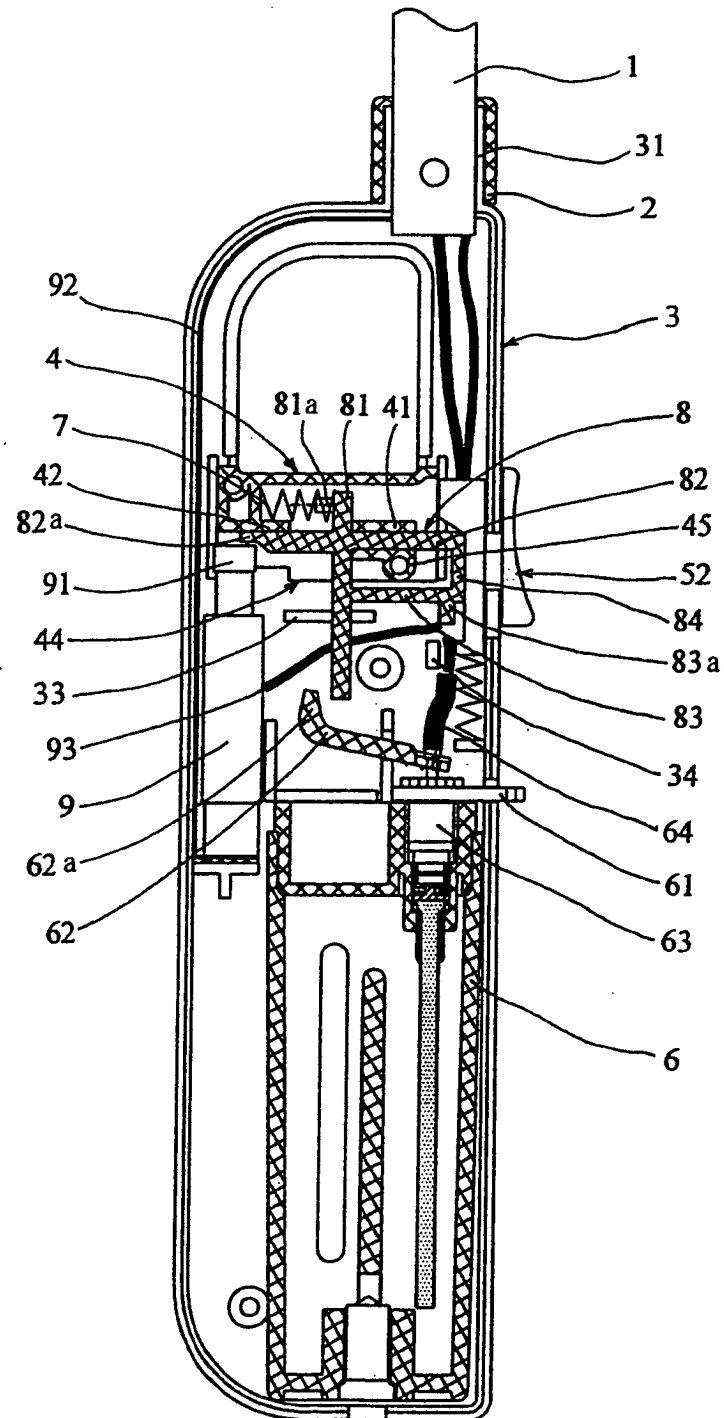


Fig.9

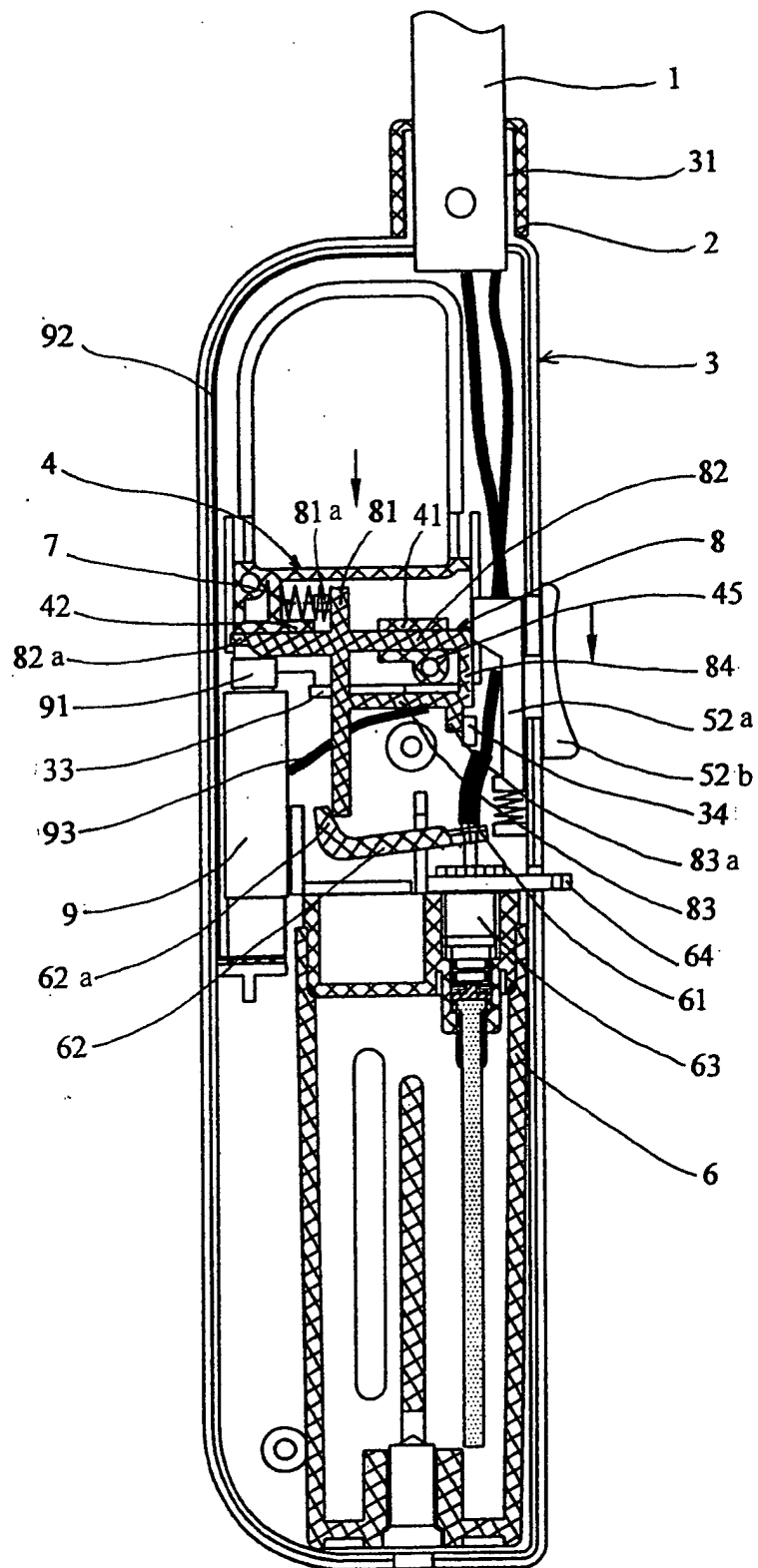


Fig.10

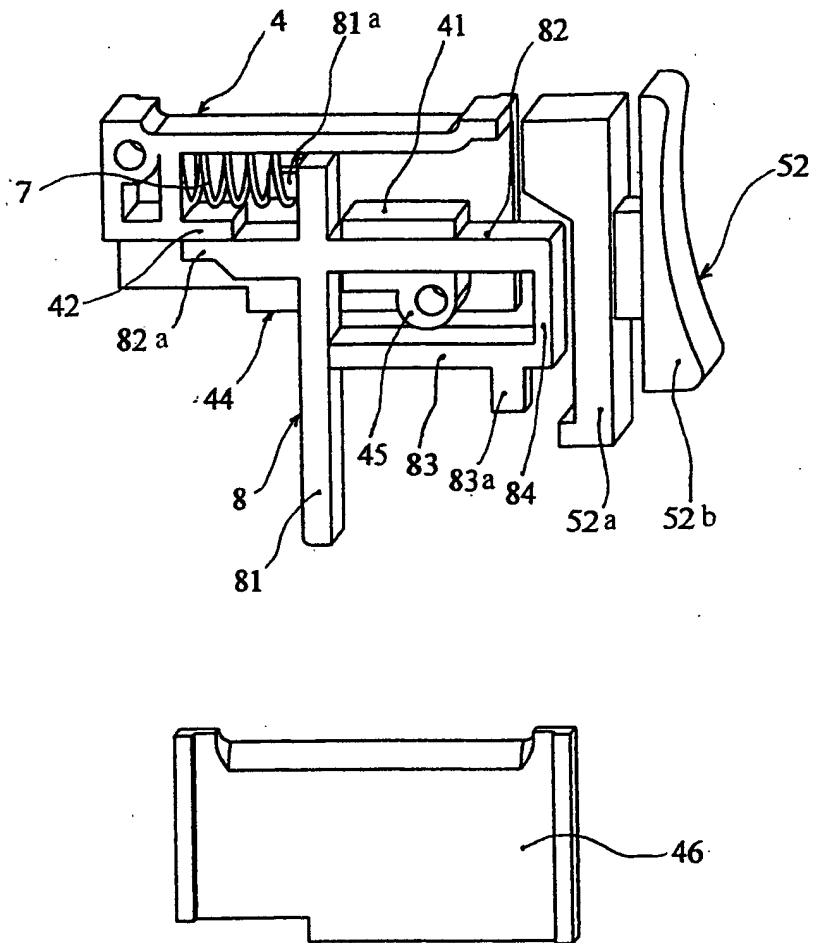


Fig.11

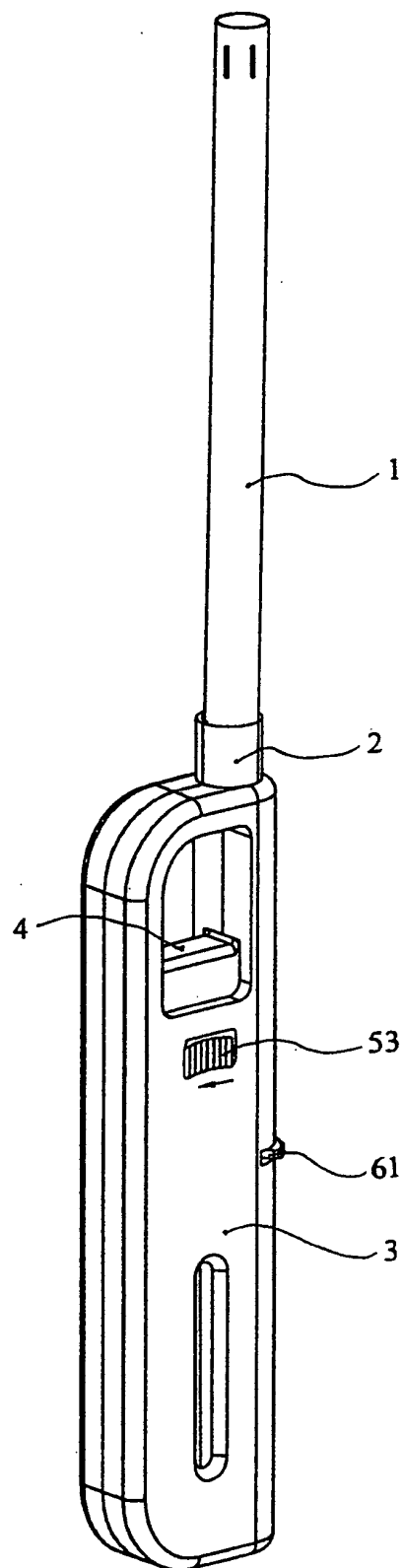


Fig.12

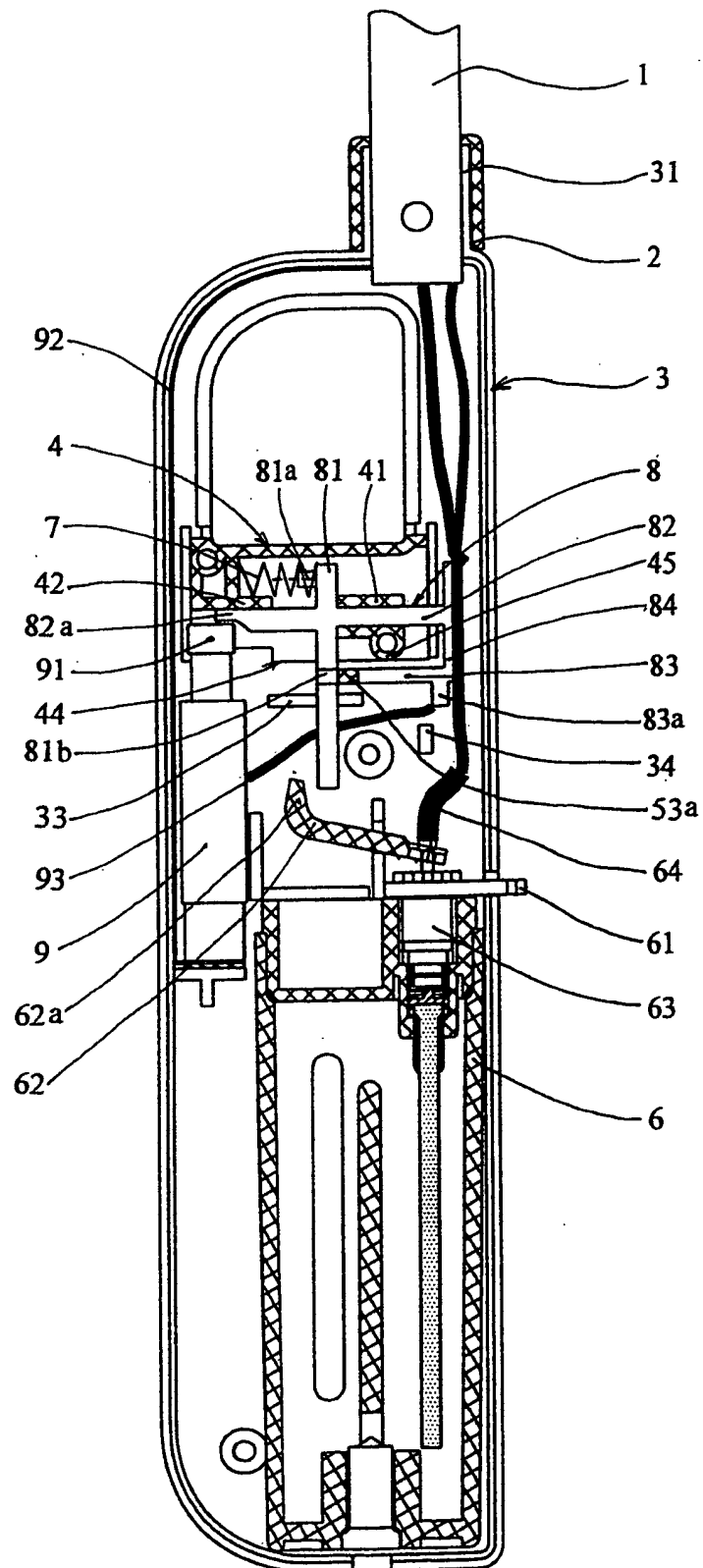


Fig.13

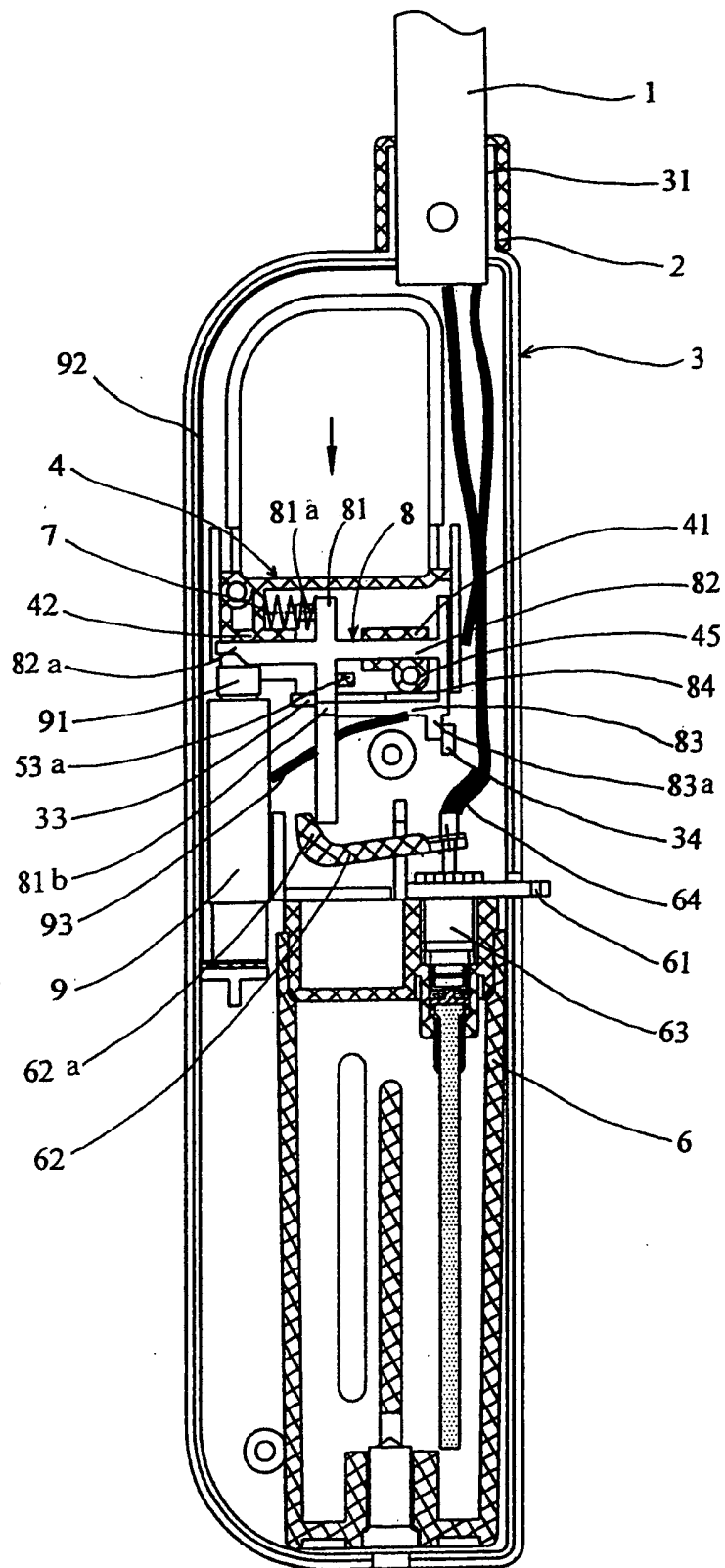


Fig.14

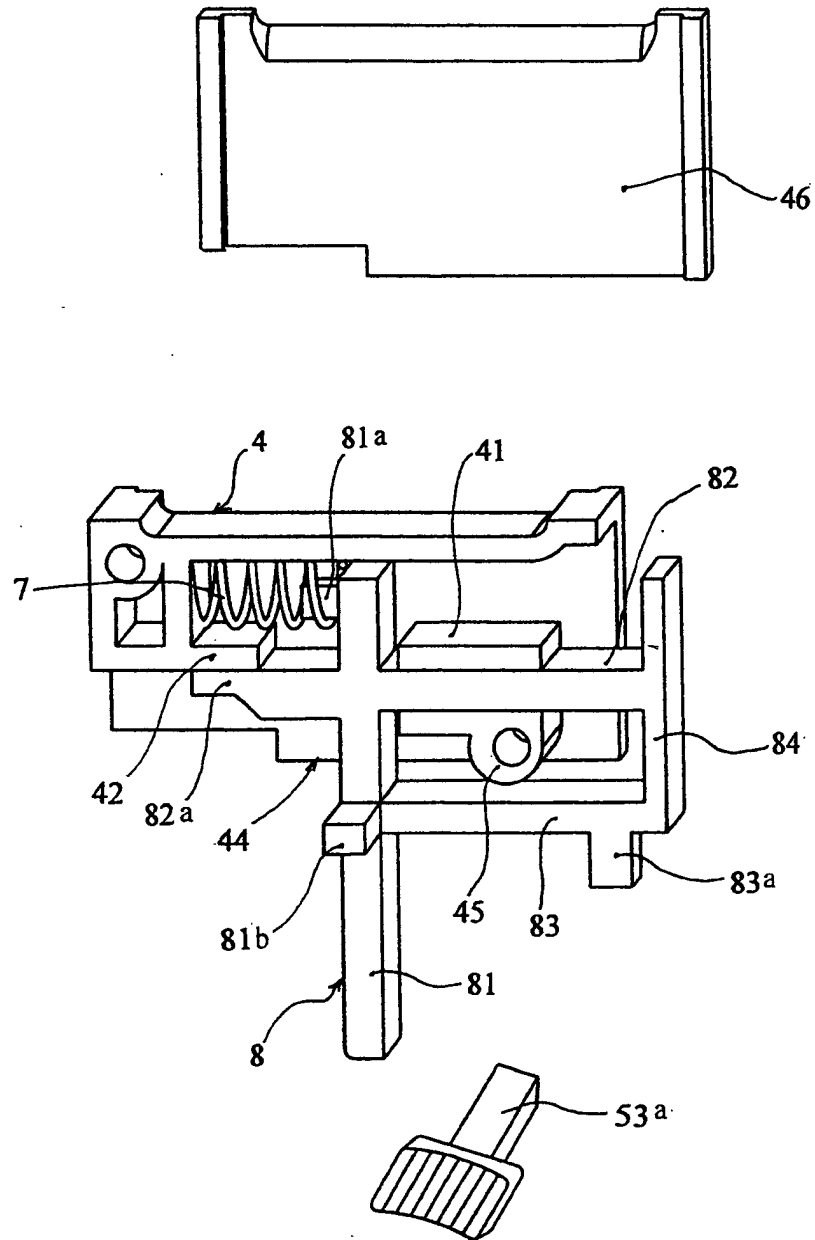


Fig.15

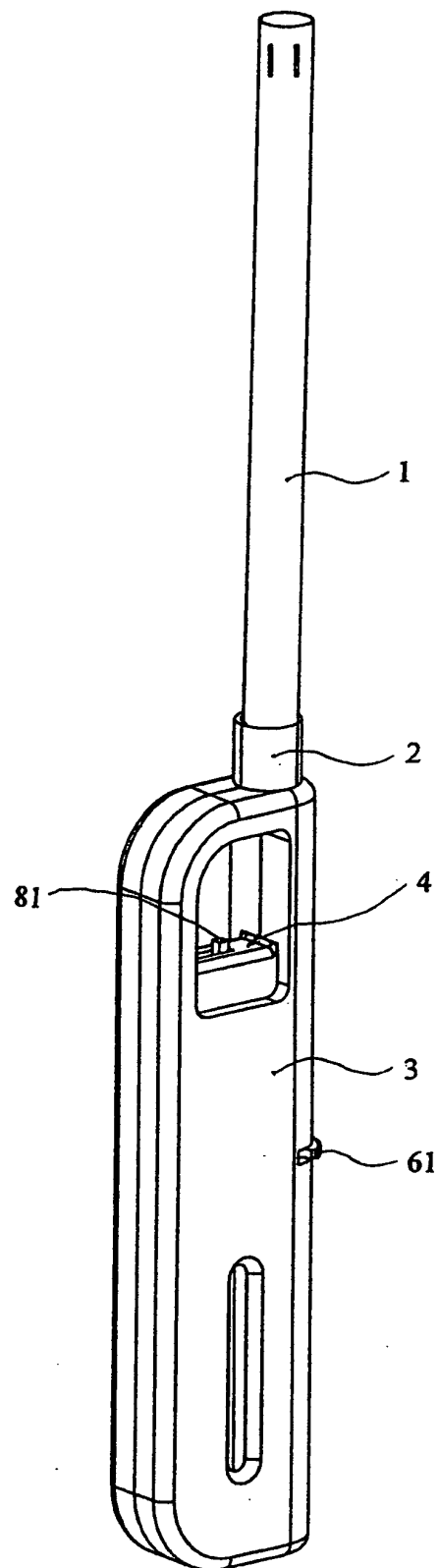


Fig.16

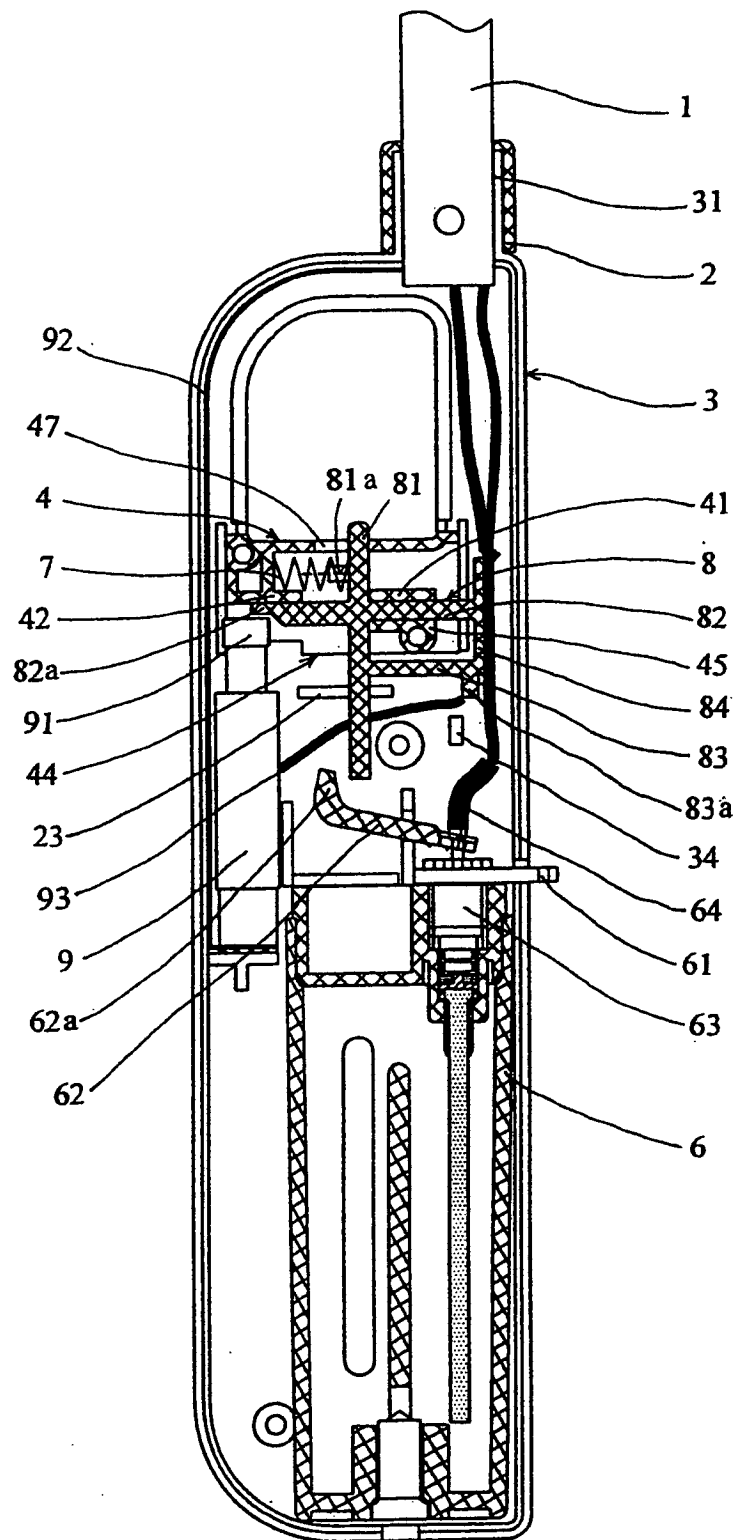


Fig.17

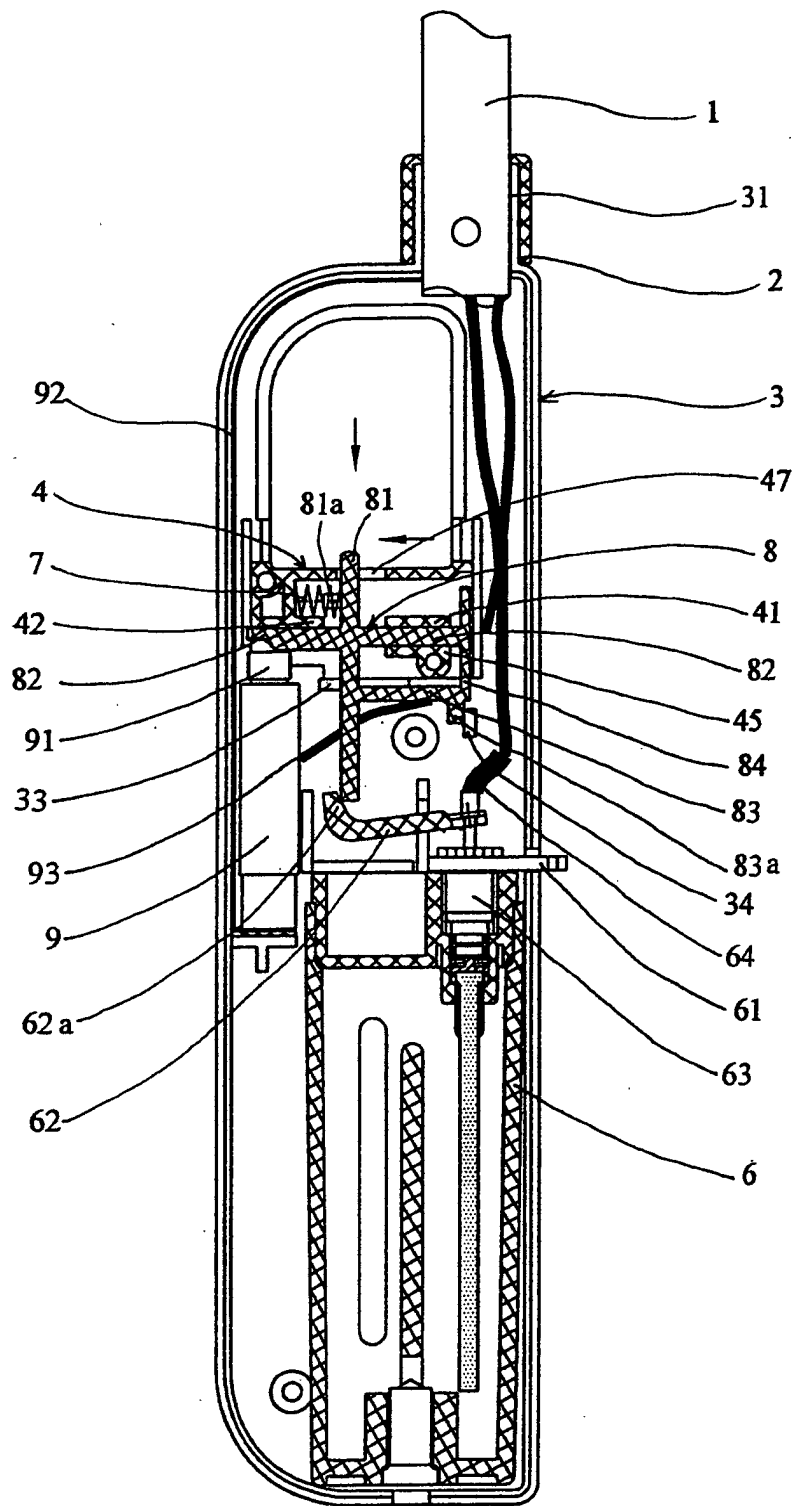


Fig. 18

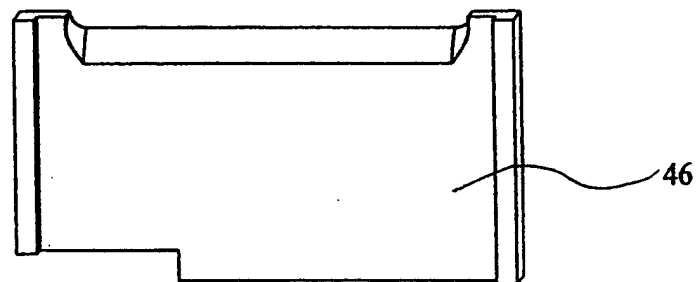
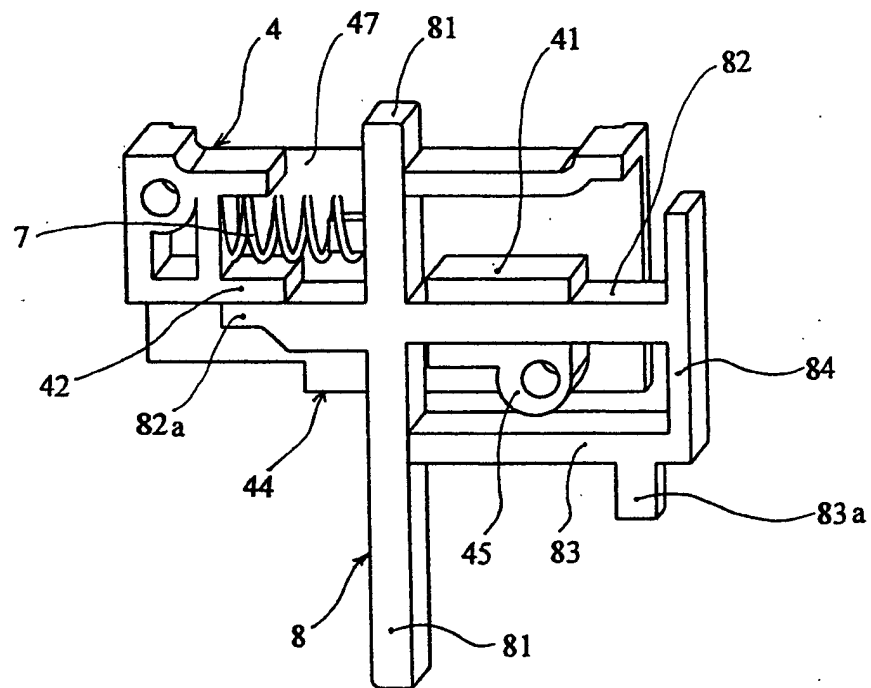


Fig.19