

Description

Technical Field

[0001] The present invention relates to a piezoelectric lighter, and more particularly to a safety arrangement for piezoelectric lighter wherein the safety arrangement normally locks the ignition cap of the piezoelectric lighter so as to prevent the piezoelectric lighter from being ignited accidentally or by children.

Background Art

[0002] Piezoelectric lighters have been known and sold throughout the world. The conventional push-down type piezoelectric generally comprises a cap which covers on top of the lighter. In order to ignite the lighter, a user must open the cap and downwardly depress an ignition button. The cap can prevent the lighter from being ignited accidentally. However, it cannot stop children from the usage of the piezoelectric lighter.

[0003] To solve the drawbacks set forth above, the push-down type piezoelectric lighter button may employ a safety switch to prevent the depression of the ignition button. However, for some other slide-down type piezoelectric lighters, the ignition button must be pushed to slide downwardly and rearwardly at the same time for ignition, the conventional safety switch designed for locking up the downward ignition button cannot fit the structure of such slid-down type piezoelectric lighter.

[0004] U.S. patent 6,135,761 generally suggests an improved slide-down type piezoelectric lighter which comprises a locking member disposed in the ignition cap for blocking up the ignition cap from being slid sidewardly with respect to a casing of the piezoelectric lighter so as to lock up the ignition cap from ignition. In which, an embodiment thereof teaches a locking member downwardly extended into the casing of the lighter in order to block up the rotation of the ignition cap. However, based on the general concept suggested in the U.S. patent 6,135,761, more alternative embodiments can be derived and developed therefrom.

Disclosure of Invention

[0005] A main object of the present invention is to provide a safety arrangement for piezoelectric lighter which can prevent the lighter from being ignited accidentally or by children.

[0006] Another object of the present invention is to provide a safety arrangement for piezoelectric lighter that normally locks up the slide-down ignition motion of the pusher cap so as to prevent any unwanted ignition of the lighter.

[0007] Another object of the present invention is to provide a safety arrangement for piezoelectric lighter, wherein in order to rotate the ignition cap downwardly and rearwardly so as to ignite the lighter, a locking mem-

ber of the safety arrangement must be manipulated and remained in an unlocking position. Therefore, children under five years old are unable to complete the ignition operation.

[0008] Another object of the present invention is to provide a safety arrangement for piezoelectric lighter which not only normally retains in a locked condition but also automatically return to a locked condition after each ignition operation so as to prevent any unintentional ignition of the lighter.

[0009] Accordingly, in order to accomplish the above objects, the present invention provides a safety arrangement for piezoelectric lighter, which comprises:

a casing receiving a liquefied gas storage and an ignition cavity provided therein;

a gas emitting nozzle disposed in the casing and communicating with the liquefied gas storage for control a flow of gas; and

a piezoelectric unit, which is disposed in the casing for generating piezoelectricity, comprising a movable operating part extended upwardly and an ignition tip extended to a position close to the gas emitting nozzle, wherein when the movable operating part is depressed downwardly, the ignition tip generates sparks to ignite the gas emitted from the gas emitting nozzle;

wherein the improvement comprises a safety arrangement which comprises:

an ignition cap slidably mounted on the casing in a radially movable manner wherein the ignition cap is attached to a top end of the piezoelectric unit and arranged in such a manner that when the ignition cap is pushed downwardly and rearwardly at the same time, the movable operating part of the piezoelectric unit is depressed to ignite the piezoelectric lighter, wherein the ignition cap has an operation slot provided on a rear portion thereof to communicate with outside;

a locking member movably attached to a rear portion of the ignition cap for blocking up the ignition cap from being slid sidewardly with respect to the outer wall of the casing of the piezoelectric lighter so as to lock up the ignition cap from ignition,

wherein the locking member comprises an operation button extended to the operation slot of the ignition cap for operating the locking member to move from a normally locking position to an unlocking position; and

a resilient element which is disposed between the locking member and the ignition cap for applying an

urging pressure against the locking member so as to normally retain the locking member in the locking position, wherein at the locking position, the ignition cap is locked for downward and rearward movement by blocking the locking member with the casing so as to prevent ignition, and that in the unlocking position, the locking member is moved to release the blocking up of the ignition cap with the casing, so that the ignition cap is capable of being slid downwardly and sidewardly to ignite the piezoelectric lighter.

Brief Description of Drawings

Fig. 1 is a partially exploded perspective view of a piezoelectric lighter employed with a safety arrangement according to a first preferred embodiment of the present invention.

Figs. 2A and 2B are partial section views illustrating the safety arrangement of the piezoelectric lighter according to the above first preferred embodiment of the present invention.

Fig. 3 is a partially exploded perspective view of a first alternative mode of the piezoelectric lighter employed with the safety arrangement according to the above first preferred embodiment of the present invention.

Figs. 4A and 4B are partial section views illustrating the safety arrangement of the piezoelectric lighter according to the above first alternative mode of the first preferred embodiment of the present invention.

Fig. 5 is a partially exploded perspective view of a second alternative mode of the piezoelectric lighter employed with a safety arrangement according to the above first preferred embodiment of the present invention.

Fig. 6 is a partially exploded perspective view of a third alternative mode of the piezoelectric lighter employed with the safety arrangement according to the above first preferred embodiment of the present invention.

Fig. 7 is a partially exploded perspective view of a fourth alternative mode of the piezoelectric lighter employed with the safety arrangement according to the above first preferred embodiment of the present invention.

Figs. 8A and 8B are partial section views illustrating the safety arrangement of the piezoelectric lighter according to the fourth alternative mode of the above first preferred embodiment of the present invention.

Fig. 9 is a perspective view of the piezoelectric lighter employed with the safety arrangement according to a second preferred embodiment of the present invention.

Figs. 10A and 10B are partial section views illustrating the safety arrangement of the piezoelectric lighter according to the above second preferred embodiment of the present invention.

Figs. 11A and 11B are partial section views illustrating an alternative resilient element capable of embodying in the safety arrangement of the piezoelectric lighter according to the above second preferred embodiment of the present invention.

Fig. 12 is a perspective view of a first alternative mode of the piezoelectric lighter employed with the safety arrangement according to the above second preferred embodiment of the present invention.

Figs. 13A and 13B are perspective views illustrating the piezoelectric lighter employed with safety arrangement according to a third preferred embodiment of the present invention.

Best Mode for Carrying Out the Invention

[0010] Referring to Figs. 1, 2A and 2B of the drawings, a piezoelectric lighter 1 equipped with a safety arrangement 2 according to a first preferred embodiment of the present invention is illustrated. The piezoelectric lighter 1, such as a standard piezoelectric lighter, comprises a casing 10 receiving a liquefied gas storage 11 and an ignition cavity 101 provided therein, a gas emitting nozzle 15 disposed in the casing 10 and communicating with the liquefied gas storage 11 for control a flow of gas, a piezoelectric unit 13 disposed in the casing 10 for generating piezoelectricity, and a safety arrangement 2 which comprises an ignition cap 21, a locking member 22 for blocking up the ignition cap 21 from being slid sidewardly with respect to a rear side of the casing 10 of the piezoelectric lighter 1, and a resilient element 23 disposed between the locking member 22 and the ignition cap 21 for applying an urging pressure against the locking member 22 so as to normally retain the locking member 22 in the locking position.

[0011] The piezoelectric unit 13, which is disposed in the casing 10, comprises a movable operating part 131 extended upwardly and an ignition tip 16 extended to a position close to the gas emitting nozzle 15, wherein when the movable operating part 131 is depressed downwardly, the ignition tip 16 generates sparks to ignite the gas emitted from the gas emitting nozzle 15 at the same time.

[0012] The casing 10 includes an interior case 101 and an exterior case 102. The ignition cap 21 is slidably mounted on the interior case 101 of the casing 10 by

pivotally connecting two downwardly extended pivot arms 211 of the ignition cap 21 with a lower portion of the interior case 101 so as to pivotally support the ignition cap 21 in a radially movable manner.

[0013] A rear portion of the ignition cap 21 positioned above a top end of the movable operating part 131 of the piezoelectric unit 13 is functioned as a pusher 212 and arranged in such a manner that when the ignition cap 21 is pushed downwardly and rearwardly with respect to the casing 10 at the same time, the movable operating part 131 of the piezoelectric unit 13 is depressed to ignite the piezoelectric lighter 1. Moreover, the ignition cap 21 has an operation slot 213 provided on a rear portion thereof to communicate with outside.

[0014] The locking member 22 is movably attached to a rear portion of the ignition cap 21 so as to lock up the ignition cap 21 from ignition, wherein an upper rear portion of the locking member 22 forms as an operation button 221 extended to the operation slot 213 of the ignition cap 21 for operating the locking member 22 to move from a normally locking position to an unlocking position.

[0015] Accordingly, at the locking position, the ignition cap 21 is locked for downward and rearward movement by blocking the locking member 22 with the casing 10 so as to prevent ignition. Moreover, in the unlocking position, the locking member 22 is moved to release the blocking up of the ignition cap 21 with the casing 10, so that the ignition cap 21 is capable of being slid downwardly and sidewardly to ignite the piezoelectric lighter 1.

[0016] According to the first preferred embodiment, the ignition cap 21 has a locker cavity 215 provided below the pusher 212 thereof for receiving the safety arrangement 2 therein. Moreover, a rear wall 210 of the ignition cap 21 has an opening provide thereon forming the operation slot 213, through which the locker cavity 215 can communicate with outside, and a stopping edge 218 right above the operation slot 213.

[0017] According to the first preferred embodiment, an outer side of a top end of the locking member 22 forms the operation button 221 and a bottom end portion of the locking member 22 is tapered to form a locking latch 222. Moreover, a stopper 223 is integrally and upwardly protruded from an inner side of the top end of the locking member 22 and a spring holder 224 is frontwardly protruded from a front side of the top end of the locking member 22.

[0018] The locking member 22, between the operation button 221 and the locking latch 222, is pivotally mounted in the locker cavity 215 by a pivot pin 24 in such a manner that, as shown in Fig. 2A, the operation button 221 is pressed by the resilient element to outwardly protrude from the casing 10 through the operation slot 213 while the locking latch 222 is positioned at a locking position, i.e. adjacent to an outer wall 17 of the casing 10. The resilient element 23 is a compression spring mounted between the locking member 22 and an interior vertical support wall 216 of the locker cavity 215

by connecting one end with the spring holder 224 and the other end engaged in a holding hole 217 provided on the support wall 216, wherein the resilient element 23 applies an urging force against the operation button 221 to push it rearwardly until the stopper 223 is stopped by the stopping edge 218 of the ignition cap 21, wherein the locking latch 222 is slightly rotated to extended below the locker cavity 215 and maintain in such a locking position that substantially blocks any sideward and downward movement of the ignition cap 21. It is because, as shown in Fig. 2A, when a user wants to ignite the piezoelectric lighter 1 by operating the pusher 212 of the ignition cap 21 to move downwardly and rearwardly, the locking latch 222 of the locking member 22 will be driven more inwards to hit on a top edge of the outer wall 17. In other words, the outer wall 17 acts as a locker to block the downwards and rearwards movement of the ignition cap 21 so as to prevent the movable operating part 131 of the piezoelectric unit 13 from being depressed to ignite the piezoelectric lighter 1.

[0019] To ignite the piezoelectric lighter 1, the user must unlock the locking member 22 and operate the ignition cap 21 at the same time. As shown in Fig. 2B, the user must use a lower portion of his or her thumb to inwardly press in the operation button 221 of the locking member, so that the locking member 22 will be pushed to pivotally rotate upwards about the pivot pin 24 so as to move the tapered locking latch 222 of the locking member 22 out of the casing 10, i.e. in an unlocking position, and then the user can use an upper portion of his or her thumb to depress the pusher 212 of the ignition cap 21. Since the press-in action of the operation button 221 moves the locking member 22 to the unlocking position, where the slope surface 222A of the locking latch 222 is aligned with the slide down path of the ignition cap 21 so that the locking latch 222 will not block the movement path of the ignition cap 21, the ignition cap 21 is free to be depressed downwardly and sidewardly to depress down the movable operating part 131 of the piezoelectric unit 13 to ignite the piezoelectric lighter 1.

[0020] After the piezoelectric lighter 1 is ignited, the user may release the depressing of the operation button 221 of the locking member 22. To maintain the flame of the piezoelectric lighter 1, the user may simply remain pressing against the pusher 212 of ignition cap 21. When the user also releases the depressing force on the pusher 212, the compressed piezoelectric unit 13 will rebound to its original form which pushes the ignition cap 21 back to its original locking position. Furthermore, the slope surface 222A of the locking latch 222 will slide along the top edge of the outer wall 17 of the casing 10 and back into the casing 10. The compressed resilient element 23 will then rebound rearwardly the operation button 221 and force the locking member 22 remaining at its locking position.

[0021] Figs. 3 and 4A illustrates a first alternative mode of the above first preferred embodiment of the piezoelectric lighter 1' of the present invention, wherein

the operation button 221' of the locking member 22 is modified to affix on top of the locking member 22 and substitute the stopper 223. Moreover, a guiding slot 25 is additionally formed on a top surface of the pusher 212 of the ignition cap 21, wherein the operation button 221' is frontwardly and upwardly extended to slidably positioned at the guiding slot 25. Therefore, to unlock the locking member 22 and operate the ignition cap 21 at the same time, as shown in Fig. 4B, the user must push the operation button 221' forwards so as to pivotally move the tapered locking latch 222 of the locking member 22 out of the casing 10, i.e. in an unlocking position, and then the user can depress the pusher 212 of the ignition cap 21. Since the front-pushing action of the operation button 221' moves the locking member 22 to the unlocking position, where the slope surface 222A of the locking latch 222 is aligned with the slide down path of the ignition cap 21 so that the locking latch 222 will not block the movement path of the ignition cap 21, the ignition cap 21 is free to be depressed downwardly and sidewardly to depress down the movable operating part 131 of the piezoelectric unit 13 to ignite the piezoelectric lighter 1'.

[0022] After the piezoelectric lighter 1' is ignited, the user may release the front-pushing of the operation button 221' of the locking member 22. While releasing the sideward force on the ignition cap 21, the compressed piezoelectric unit 13 will rebound to its original form, which pushes the ignition cap 21 back to its original locking position. Furthermore, the slope surface 222A of the locking latch 222 will slide along the top edge of the outer wall 17 of the casing 10 and back into the casing 10. The compressed resilient element 23 will then rebound rearwardly the operation button 221' and force the locking member 22 remaining at its locking position.

[0023] Fig. 5 illustrates a second alternative mode of the above first preferred embodiment of the piezoelectric unit 1" of the present invention, wherein the operation button 221" of the locking member 22 is modified to affix on a top side of the locking member 22 and substitute the stopper 223. Moreover, a guiding slot 25" is additionally formed on a side surface of the pusher 212 of the ignition cap 21, wherein the operation button 221" is frontwardly and sidewardly extended to slidably positioned at the guiding slot 25. Therefore, to unlock the locking member 22 and operate the ignition cap 21 at the same time, the user must move the operation button 221" forwards so as to pivotally move the tapered locking latch 222 of the locking member 22 out of the casing 10, i.e. in an unlocking position, and then the user can depress the pusher 212 of the ignition cap 21. Since the front-moving action of the operation button 221" moves the locking member 22 to the unlocking position, where the slope surface 222A of the locking latch 222 is aligned with the slide down path of the ignition cap 21 so that the locking latch 222 will not block the movement path of the ignition cap 21, the ignition cap 21 is free to be depressed downwardly and sidewardly to depress down

the movable operating part 131 of the piezoelectric unit 13 to ignite the piezoelectric lighter 1". After the piezoelectric lighter 1" is ignited, the user may release the front-moving of the operation button 221" of the locking member 22. While releasing the sideward force on the ignition cap 21, the compressed piezoelectric unit 13 will rebound to its original form, which pushes the ignition cap 21 back to its original locking position. Furthermore, the slope surface 222A of the locking latch 222 will slide along the top edge of the outer wall 17 of the casing 10 and back into the casing 10. The compressed resilient element 23 will then rebound rearwardly the operation button 221" and force the locking member 22 remaining at its locking position.

[0024] Fig. 6 illustrates a third alternative mode of the above first preferred embodiment of the present invention, wherein the two side walls of the ignition cap 21 are substituted by two downwardly and rearwardly extending arms 219 for pivotally mounting the locking member 21. Also, the ignition cavity 215 is the spaced between the two arms 219 and the pusher 212. The third alternative mode functions exactly like the first preferred embodiment as shown in Fig. 1.

[0025] Figs. 7 to 8B illustrates a fourth alternative mode of the first preferred embodiment of the piezoelectric unit 1A of the present invention, which is an alternative mode of the above second alternative mode as shown in Figs. 3 to 4B. The locking member 22A also comprises an operation button 221A at a top end portion thereof and a locking latch 222A at a bottom end portion thereof. However, the locking member 22A is pivotally mounted in the locker cavity 215 of the ignition cap 21 at a L-shaped upper portion 225A thereof, so as to position the operation button 221A at the guiding slot 25 of the ignition cap 21 while the spring holder 224A is downwardly extended from the operation button 221A.

[0026] As shown in Figs. 8A and 8B, the resilient element 23A is modified to vertically mount between the operation button 221A and an interior horizontal support wall 216A inside the locker cavity 215 by connecting a top end with the spring holder 224A and a bottom end engaged in a holding hole 217A provided on the support wall 216A.

[0027] Therefore, to unlock the locking member 22A and operate the ignition cap 21 at the same time, as shown in Fig. 4B, the user must first depress the operation button 221A downwards so as to pivotally move the tapered locking latch 222A of the locking member 22A out of the casing 10, i.e. in an unlocking position, as shown in Fig. 8B, and then the user can further depress the pusher 212 of the ignition cap 21. Since the depressing action of the operation button 221A moves the locking member 22A to the unlocking position, where the locking latch 222 will not block the movement path of the ignition cap 21, i.e. the ignition cap 21 is free to be depressed downwardly and sidewardly to depress down the movable operating part 131 of the piezoelectric unit 13 to ignite the piezoelectric lighter 1A.

[0028] After the piezoelectric lighter 1A is ignited, the user may release the depressing of the operation button 221A of the locking member 22A. While further releasing the sideward force on the ignition cap 21, the compressed piezoelectric unit 13 will rebound to its original form, which pushes the ignition cap 21 back to its original locking position. Furthermore, the locking latch 222A will slide along the top edge of the outer wall 17 of the casing 10 and back into the casing 10. The compressed resilient element 23A will then rebound upwardly the operation button 221A and force the locking member 22A remaining at its locking position.

[0029] Referring to Figs. 9 to 10B, a second preferred embodiment of the piezoelectric lighter 1B of the present invention is illustrated, wherein the pusher 212 B of the ignition cap 21B has a guiding slot 25B provided thereon and no operation slot. An indentation provided at a top edge of the outer wall 17B forms the operation slot 213B.

[0030] The locking member 22B is a curved body having a bottom tail portion horizontally extended to form the locking latch 222B and the operation button 221A is integrally provided at a top portion of the locking member 22B, wherein locking member 22B is supported to have the locking latch 222B extended to insert in the operation slot 213B and the operation button is slidably positioned in the guiding slot 25B.

[0031] The locking member 22B also comprises a spring holder 224B projected from a rear side thereof. The resilient element 23B is mounted in the locker cavity 215B with a front end supported by the spring holder 224B and a rear end supported by a spring supporter 219B protruded from a rear wall of the ignition cap 21B.

[0032] As shown in Fig. 10A, normally the resilient element 23B pushes the locking member 22B forwards to maintain the locking member 22B in a locking position, wherein the locking latch 222B is extended to engage in the operation slot 213B that blocks the ignition cap 21B from being pivotally moved downwardly and rearwardly by the outer wall 17B of the casing 10B, so as to lock up the ignition cap 21B from ignition.

[0033] As shown in Fig. 10B, in order to ignite the piezoelectric lighter 1B, the user needs to use his or her thumb to push the operation button 221B rearwardly so as to compress the resilient element 23B and drive the locking member 22B rearwardly to a unlocking position where the locking latch 222B moves out of the operation slot 213B so that the inclined curved body of the locking member 22B will not block with the outer wall 17B. At such unlocking position, the blocking of the ignition cap 21B is released and the user can easily ignite the piezoelectric lighter 1B by depressing the ignition cap 21B downwardly and rearwardly.

[0034] When the user also releases the depressing force on the pusher 212B, the compressed piezoelectric unit will rebound to its original form which pushes the ignition cap 21B back to its original locking position. Furthermore, the compressed resilient element 23B will then rebound forwardly the locking member 22B to its

locking position.

[0035] Figs. 11A and 11B illustrates an alternative resilient element for the above second preferred embodiment of the present invention, wherein a U-shaped spring or a Z-shaped spring element 23B' can be used to substitute the regularly spring 23B as described in the above second preferred embodiment as shown in Figs. 9 to 10B.

[0036] Fig. 12 illustrates a first alternative mode of the above second preferred embodiment of the present invention, which is structurally identical to the second preferred embodiment, except that the sliding slot 25B of the second preferred embodiment is provided on a top wall of the pusher 212B of the ignition cap 21B but the sliding slot 25B' of this first alternative mode is provided on a side wall of the pusher 212B of the ignition cap 21B and the operation button 221B is extended sidewardly from at top end of the locking member 22B to slidably placed in the sliding slot 25B'.

[0037] Referring to Figs. 13A and 13B, a piezoelectric lighter 1C according to a third preferred embodiment of the present invention is illustrated, which is structurally and functionally similar to the above first and second embodiment that the piezoelectric lighter 1C also employed with a safety arrangement comprising which comprises an ignition cap 21C, a locking member 22C, and a resilient element 23C.

[0038] The ignition cap 21C is also slidably mounted on the casing 10C in a radially movable manner wherein the ignition cap 21C is attached to a top end of the piezoelectric unit provided in the casing 10C as usual, wherein the casing 10C has an operation slot 213C provided on outer wall 17C thereof to communicate with outside.

[0039] The locking member 22C is movably attached to a rear portion of the ignition cap 21C for blocking up the ignition cap 21C from being slid sidewardly with respect to the outer wall 17C of the casing 10C of the piezoelectric lighter 1C so as to lock up the ignition cap 21C from ignition, wherein the locking member 22C comprises an operation button 221C extended to the operation slot 213C of the ignition cap 21C for operating the locking member 22C to move from a normally locking position to an unlocking position.

[0040] The resilient element 23C which is disposed between the locking member 22C and the ignition cap 21C for applying an urging pressure against the locking member 22C so as to normally retain the locking member 22C in the locking position, wherein at the locking position, the ignition cap 21C is locked for downward and rearward movement by blocking the locking member 22C with the casing 10C so as to prevent ignition, and that in the unlocking position, the locking member 22C is moved to release the blocking up of the ignition cap 21C with the casing 10C, so that the ignition cap 21C is capable of being slid downwardly and sidewardly to ignite the piezoelectric lighter 1C.

[0041] Moreover, a guiding slot 25C is also formed on

a top wall of the pusher 212C of the ignition cap 21C, wherein the operation button 221C is upwardly extended to slidably supported in the guiding slot 25C. The operation slot 213C is indented at one side of a top edge of the outer wall 17C, which is the rear wall according to the present third embodiment. A locking latch 222C is rearwardly extended from a bottom end of the locking member 22C.

[0042] The resilient element 23C can be a spring mounted between the locking member 22C and a side wall of the ignition cap 21C within the locker cavity 215C, so as to urge the locking member 22C remaining in the locking position where the locking latch 222C is blocked by the top edge of the outer wall 17C of the casing 10C for locking the piezoelectric lighter 1C from preventing unwanted ignition. In order to ignite the piezoelectric lighter 1C, the user must unlock the locking member 22C and operate the ignition cap 21C at the same time. As shown in Fig. 13B, the user must use his or her thumb to sidewardly push the operation button 221C of the locking member 22C until the locking latch 222C of the locking member 22C is aligned with the operation slot 213C and maintain such an unlocking position. Then, the user is free to depress the pusher 212C of the ignition cap 21C downwardly and sidewardly to depress down the movable operating part of the piezoelectric unit to ignite the piezoelectric lighter 1C.

[0043] After the piezoelectric lighter 1C is ignited, the user may release the side pushing of the operation button 221C of the locking member 22C. To maintain the flame of the piezoelectric lighter 1C, the user may simply remain pressing against the pusher 212C of ignition cap 21C. When the user also releases the depressing force on the pusher 212C, the compressed piezoelectric unit 13C will rebound to its original form which pushes the ignition cap 21C back to its original locking position and the compressed resilient element 23C will rebounds the operation button 221C sideways back its locking position.

[0044] In accordance with the preferred embodiments and their alternative modes as disclosed above, the piezoelectric lighter of the present invention can prevent the lighter to be unintentional ignited. The operation button can be extended to different locations such as on the top wall, the rear wall, and the side wall of the ignition cap for operation. Also, the operation button can be manipulated in different operating directions such as sideward, frontward and backward, and inward and outward directions. The operation slot can also be provided either on the ignition cap or the top edge of the outer wall of the casing. Thus, the safety arrangement does not occupy space of the casing of the piezoelectric lighter in order to not limit the size and shape of the piezoelectric lighter. The safety arrangement will block the ignition cap in a rotationally movable manner in order to prevent the unintentional ignition. Furthermore, children are unable to ignite the lighter since they are unable to remain the safety arrangement in the unlocking position to ignite

the lighter while the operation button can be manipulated in various operating directions.

5 Claims

1. A piezoelectric lighter, comprising a casing receiving a liquefied gas storage and an ignition cavity provided therein, a gas emitting nozzle disposed in said casing and communicating with said liquefied gas storage for control a flow of gas, and a piezoelectric unit disposed in said casing for generating piezoelectricity, wherein the improvement comprises a safety arrangement which comprises an ignition cap, a locking member for blocking up said ignition cap from being slid sidewardly with respect to an outer wall of said casing of said piezoelectric lighter, and a resilient element disposed between said locking member and said ignition cap for applying an urging pressure against said locking member so as to normally retain said locking member in said locking position, thereby in order to ignite said piezoelectric lighter, said locking member is required to operate to an unlocking position by moving said locking member to release the blocking up of said ignition cap with said casing, so that said ignition cap is capable of being slid downwardly and sidewardly to depress a movable operating part of said piezoelectric unit to generate sparks to ignite said gas emitted from said gas emitting nozzle of said piezoelectric lighter.
2. A piezoelectric lighter, as recited in claim 1, wherein said locking member is movably mounted to a rear portion of said ignition cap so as to lock up said ignition cap from ignition, wherein an upper rear portion of said locking member forms as an operation button extended to an operation slot provided on said ignition cap for operating said locking member to move from a normally locking position to an unlocking position, wherein at said locking position, said ignition cap is locked for downward and rearward movement by blocking said locking member with said a top edge of said outer wall of said casing so as to prevent ignition.
3. A piezoelectric lighter, as recited in claim 2, wherein said ignition cap has a locker cavity provided below a pusher, which is a rear top portion of said ignition cap, for receiving said safety arrangement therein, wherein a rear wall of said ignition cap has an opening provide thereon forming said operation slot, through which said locker cavity can communicate with outside.
4. A piezoelectric lighter, as recited in claim 3, wherein an outer side of a top end of said locking member forms said operation button and a bottom end por-

tion of said locking member is tapered to form a locking latch.

5. A piezoelectric lighter, as recited in claim 4, wherein said rear wall of said ignition cap further has a stopping edge provided right above said operation slot, a stopper is integrally and upwardly protruded from an inner side of said top end of said locking member and a spring holder is frontwardly protruded from a front side of said top end of said locking member.
6. A piezoelectric lighter, as recited in claim 4, wherein said locking member, between said operation button and said locking latch, is pivotally mounted in said locker cavity in such a manner that said operation button is pressed by said resilient element to outwardly protrude from said casing through said operation slot while said locking latch is positioned at a locking position, that is adjacent to said outer wall of said casing, wherein said resilient element applies an urging force against said operation button to push it rearwardly, wherein said locking latch is slightly rotated to extended below said locker cavity and maintain in such a locking position that substantially blocks any sideward and downward movement of said ignition cap, accordingly said outer wall acts as a locker to block said downwards and rearwards movement of said ignition cap so as to prevent said movable operating part of said piezoelectric unit from being depressed to ignite said piezoelectric lighter.
7. A piezoelectric lighter, as recited in claim 5, wherein said locking member, between said operation button and said locking latch, is pivotally mounted in said locker cavity in such a manner that said operation button is pressed by said resilient element to outwardly protrude from said casing through said operation slot while said locking latch is positioned at a locking position, that is adjacent to said outer wall of said casing, wherein said resilient element applies an urging force against said operation button to push it rearwardly until said stopper is stopped by said stopping edge of said ignition cap, wherein said locking latch is slightly rotated to extended below said locker cavity and maintain in such a locking position that substantially blocks any sideward and downward movement of said ignition cap, accordingly said outer wall acts as a locker to block said downwards and rearwards movement of said ignition cap so as to prevent said movable operating part of said piezoelectric unit from being depressed to ignite said piezoelectric lighter.
8. A piezoelectric lighter, as recited in claim 6, wherein said resilient element is a compression spring mounted between said locking member and an interior vertical support wall of said locker cavity by

connecting one end with said spring holder and said other end engaged in a holding hole provided on said support wall.

9. A piezoelectric lighter, as recited in claim 7, wherein said resilient element is a compression spring mounted between said locking member and an interior vertical support wall of said locker cavity by connecting one end with said spring holder and said other end engaged in a holding hole provided on said support wall.
10. A piezoelectric lighter, as recited in claim 1, wherein said locking member is movably mounted to a rear portion of said ignition cap so as to lock up said ignition cap from ignition, wherein said locking member has an operation button provided at a top end thereof and a locking latch formed at a bottom end portion thereof, wherein a guiding slot is formed on a top surface of said pusher of said ignition cap, wherein said operation button is frontwardly and upwardly extended to slidably positioned at said guiding slot for operating said locking member to move from a normally locking position to an unlocking position, wherein at said locking position, said ignition cap is locked for downward and rearward movement by blocking said locking member with said a top edge of said outer wall of said casing so as to prevent ignition.
11. A piezoelectric lighter, as recited in claim 1, wherein said locking member is movably mounted to a rear portion of said ignition cap so as to lock up said ignition cap from ignition, wherein said locking member has an operation button provided on a top side thereof and a locking latch formed at a bottom end portion thereof, wherein a guiding slot is formed on a side surface of said pusher of said ignition cap, wherein said operation button is frontwardly and sidewardly extended to slidably positioned at said guiding slot for operating said locking member to move from a normally locking position to an unlocking position, wherein at said locking position, said ignition cap is locked for downward and rearward movement by blocking said locking member with said a top edge of said outer wall of said casing so as to prevent ignition.
12. A piezoelectric lighter, as recited in claim 10, wherein said ignition cap has a locker cavity provided below a pusher, which is a rear top portion of said ignition cap, for receiving said safety arrangement therein, wherein a rear wall of said ignition cap has an opening provide thereon forming an operation slot, through which said locker cavity can communicate with outside.
13. A piezoelectric lighter, as recited in claim 11, where-

in said ignition cap has a locker cavity provided below a pusher, which is a rear top portion of said ignition cap, for receiving said safety arrangement therein, wherein a rear wall of said ignition cap has an opening provide thereon forming an operation slot, through which said locker cavity can communicate with outside.

14. A piezoelectric lighter, as recited in claim 12, wherein said locking member, between said operation button and said locking latch, is pivotally mounted in said locker cavity in such a manner that said operation button is pressed by said resilient element to outwardly protrude from said casing through said operation slot while said locking latch is positioned at a locking position, that is adjacent to said outer wall of said casing, wherein said resilient element applies an urging force against said operation button to push it rearwardly, wherein said locking latch is slightly rotated to extended below said locker cavity and maintain in such a locking position that substantially blocks any sideward and downward movement of said ignition cap, accordingly said outer wall acts as a locker to block said downwards and rearwards movement of said ignition cap so as to prevent said movable operating part of said piezoelectric unit from being depressed to ignite said piezoelectric lighter.
15. A piezoelectric lighter, as recited in claim 13, wherein said locking member, between said operation button and said locking latch, is pivotally mounted in said locker cavity in such a manner that said operation button is pressed by said resilient element to outwardly protrude from said casing through said operation slot while said locking latch is positioned at a locking position, that is adjacent to said outer wall of said casing, wherein said resilient element applies an urging force against said operation button to push it rearwardly, wherein said locking latch is slightly rotated to extended below said locker cavity and maintain in such a locking position that substantially blocks any sideward and downward movement of said ignition cap, accordingly said outer wall acts as a locker to block said downwards and rearwards movement of said ignition cap so as to prevent said movable operating part of said piezoelectric unit from being depressed to ignite said piezoelectric lighter.
16. A piezoelectric lighter, as recited in claim 14, wherein said resilient element is a compression spring mounted between said locking member and an interior vertical support wall of said locker cavity by connecting one end with said spring holder and said other end engaged in a holding hole provided on said support wall.

17. A piezoelectric lighter, as recited in claim 15, wherein said resilient element is a compression spring mounted between said locking member and an interior vertical support wall of said locker cavity by connecting one end with said spring holder and said other end engaged in a holding hole provided on said support wall.

18. A piezoelectric lighter, as recited in claim 12, wherein said locking member has a L-shaped upper portion pivotally mounted to said rear portion of said ignition cap, and said resilient element is vertically mounted between said operation button and an interior horizontal support wall inside said locker cavity, thereby in order to unlock said piezoelectric lighter, press down said operation button to move said locking latch of said locking member out of said casing, and then said pusher of said ignition cap is able to be further depressed downwardly and sidewardly to ignite said piezoelectric lighter.

19. A piezoelectric lighter, as recited in claim 18, wherein said resilient element is a compression spring and a spring holder is downwardly extended from said operation button to connect with a top end of said spring while a bottom end thereof engaged in a holding hole provided on said support wall.

20. A piezoelectric lighter, as recited in claim 10, wherein said ignition cap has a locker cavity provided below a pusher, which is a rear top portion of said ignition cap, for receiving said safety arrangement therein, wherein an indention provided at a top edge of said outer wall forms said operation slot.

21. A piezoelectric lighter, as recited in claim 20, wherein said locking member is a curved body and said locking latch is horizontally extended, wherein locking member is supported to have said locking latch extended to insert in said operation slot and said resilient element is mounted in said locker cavity with a front end supported by said spring holder and a rear end supported by a spring supporter protruded from a rear wall of said ignition cap, thereby normally said resilient element normally pushes said locking member forwards to maintain said locking member in a locking position, and said locking latch is extended to engage in said operation slot that blocks said ignition cap from being pivotally moved downwardly and rearwardly by said outer wall of said casing, so as to lock up said ignition cap from ignition, wherein in order to unlock said piezoelectric lighter, push said operation button rearwardly to compress said resilient element and drive said locking member rearwardly until said locking latch moves out of said operation slot so that said inclined curved body of said locking member do not block with said outer wall.

22. A piezoelectric lighter, as recited in claim 11, wherein said ignition cap has a locker cavity provided below a pusher, which is a rear top portion of said ignition cap, for receiving said safety arrangement therein, wherein an indention provided at a top edge of said outer wall forms said operation slot. 5
23. A piezoelectric lighter, as recited in claim 22, wherein said locking member is a curved body and said locking latch is horizontally extended, wherein locking member is supported to have said locking latch extended to insert in said operation slot and said resilient element is mounted in said locker cavity with a front end supported by said spring holder and a rear end supported by a spring supporter protruded from a rear wall of said ignition cap, thereby normally said resilient element normally pushes said locking member forwards to maintain said locking member in a locking position, and said locking latch is extended to engage in said operation slot that blocks said ignition cap from being pivotally moved downwardly and rearwardly by said outer wall of said casing, so as to lock up said ignition cap from ignition, wherein in order to unlock said piezoelectric lighter, push said operation button rearwardly to compress said resilient element and drive said locking member rearwardly until said locking latch moves out of said operation slot so that said inclined curved body of said locking member do not block with said outer wall. 10 15 20 25 30
24. A piezoelectric lighter, as recited in claim 20, wherein said locking member is movably attached to a rear portion of said ignition cap for blocking up said ignition cap from being slid sidewardly with respect to said outer wall of said casing of said piezoelectric lighter so as to lock up said ignition cap from ignition. 35
25. A piezoelectric lighter, as recited in claim 24, wherein said operation button is upwardly extended to slidably supported in said guiding slot and said locking latch is rearwardly extended from a bottom end of said locking member, wherein said resilient element is disposed between said locking member and a side wall of said ignition cap for applying an urging pressure against said locking member to normally retain said locking member in said locking position where said locking latch is blocked by said top edge of said outer wall of said casing for locking said piezoelectric lighter from preventing unwanted ignition, wherein in order to unlock said piezoelectric lighter, sidewardly push said operation button of said locking member until said locking latch of said locking member is aligned with said operation slot. 40 45 50 55

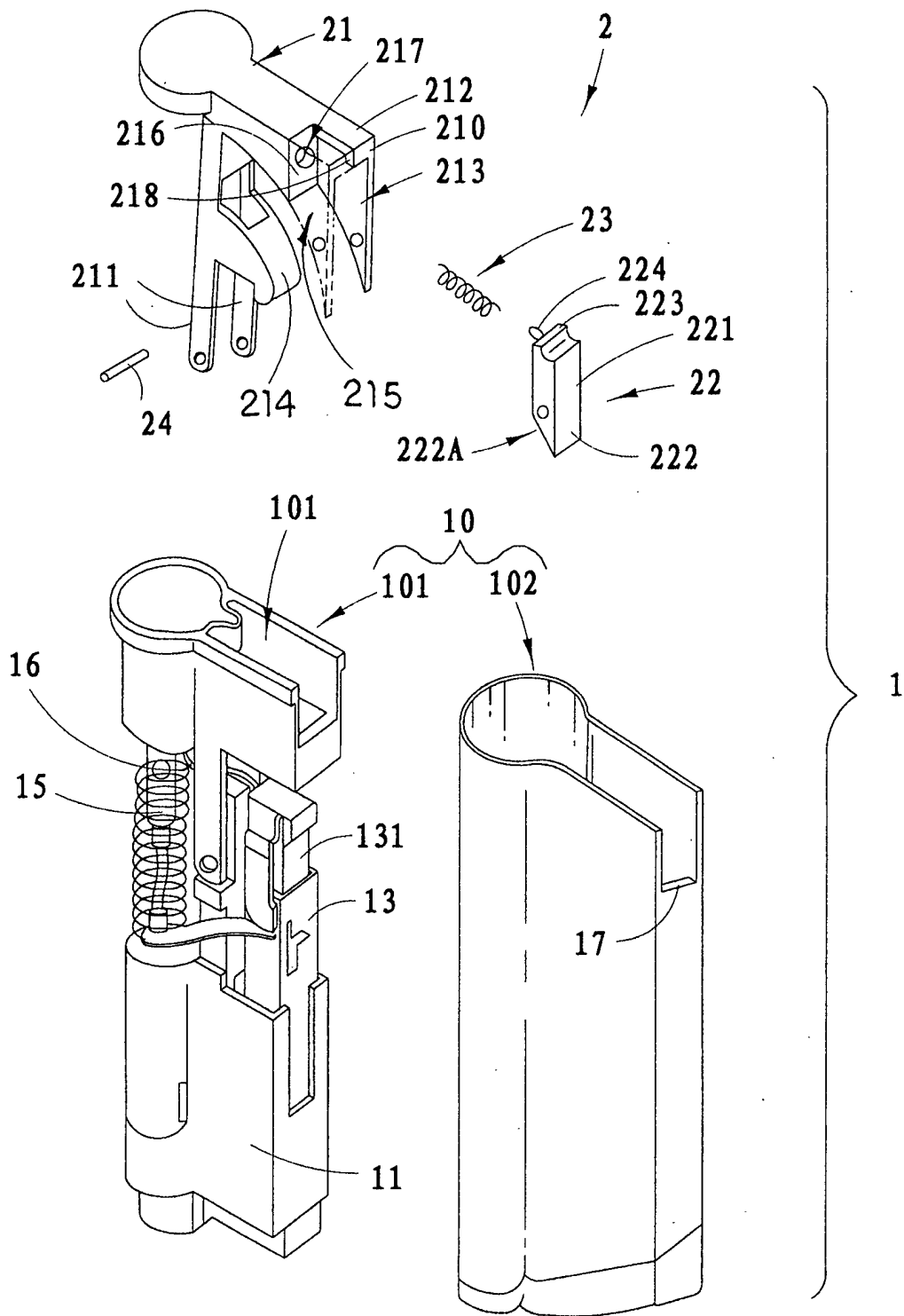


FIG. 1



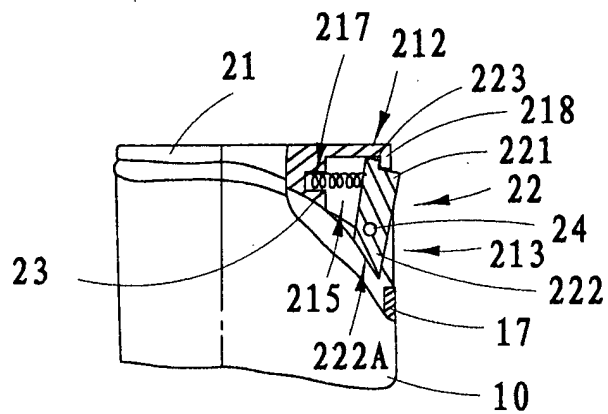


FIG. 2A

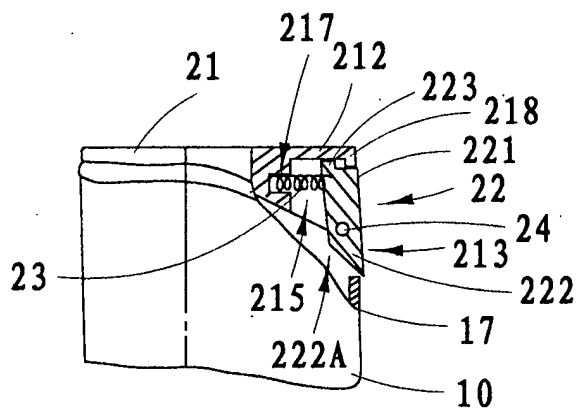


FIG. 2B

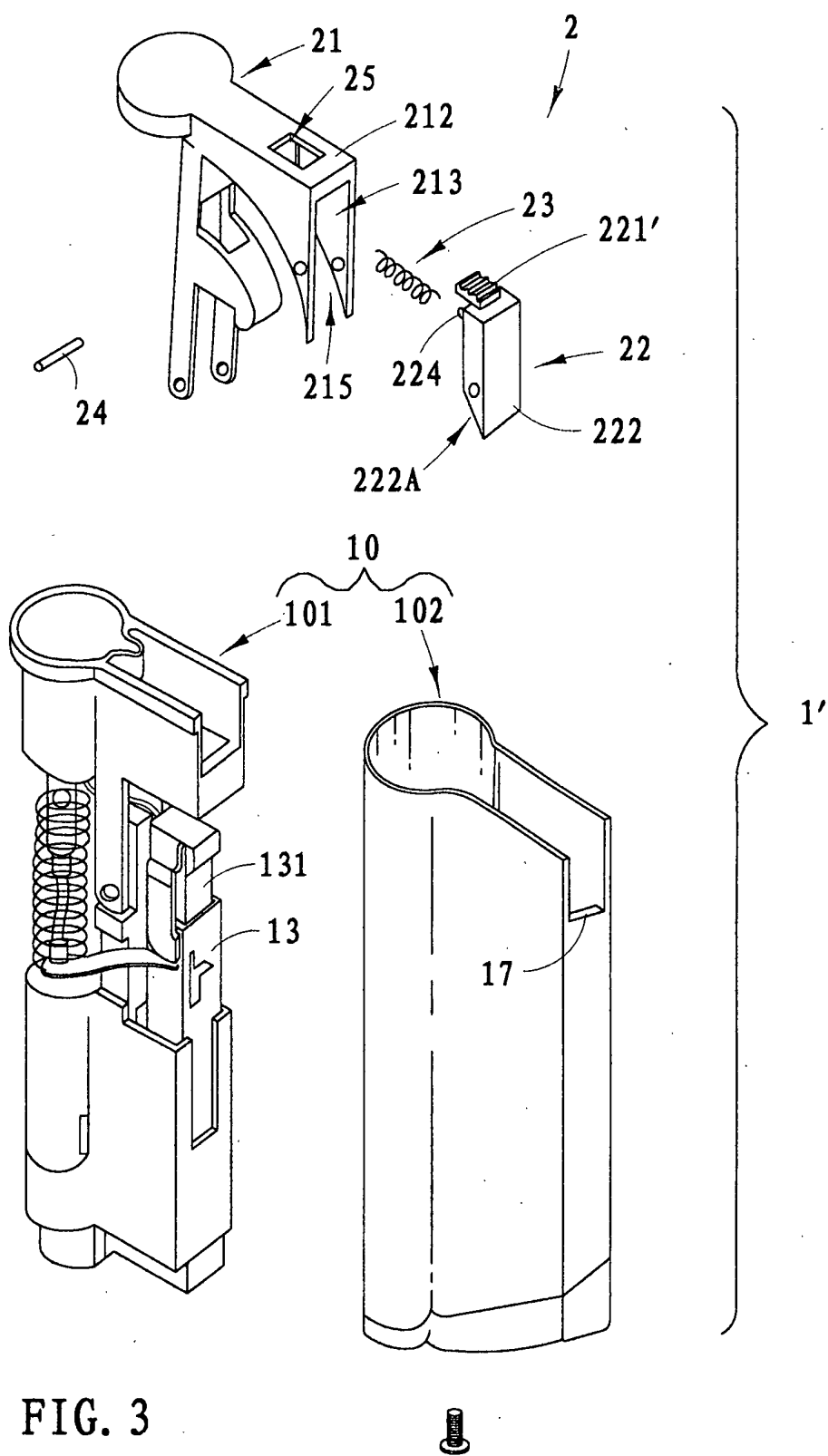


FIG. 3

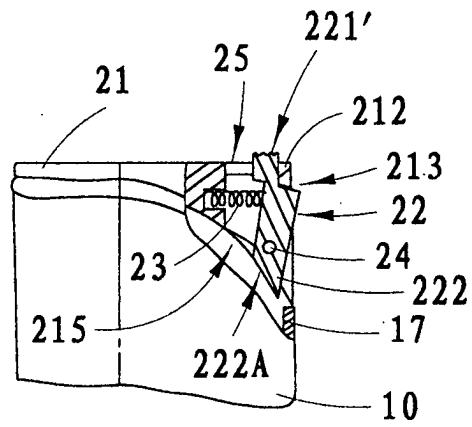


FIG. 4A

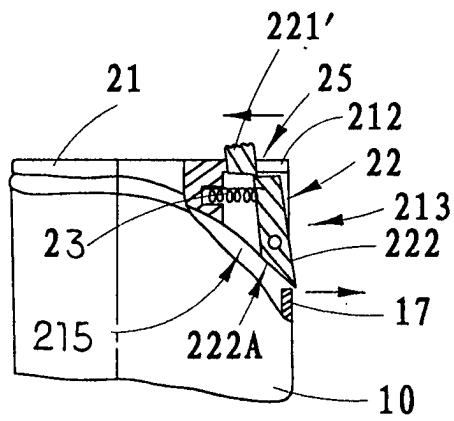


FIG. 4B

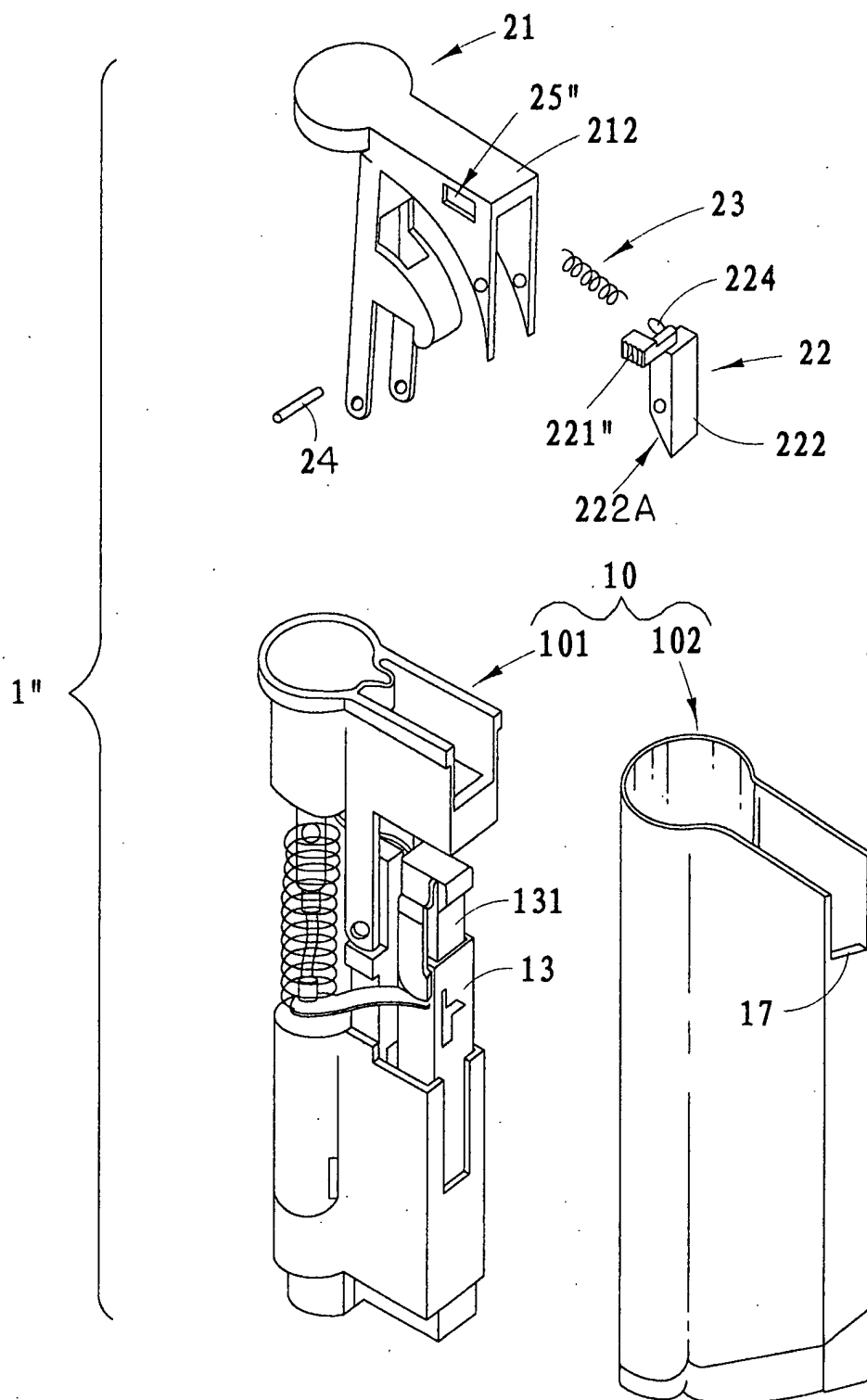


FIG. 5



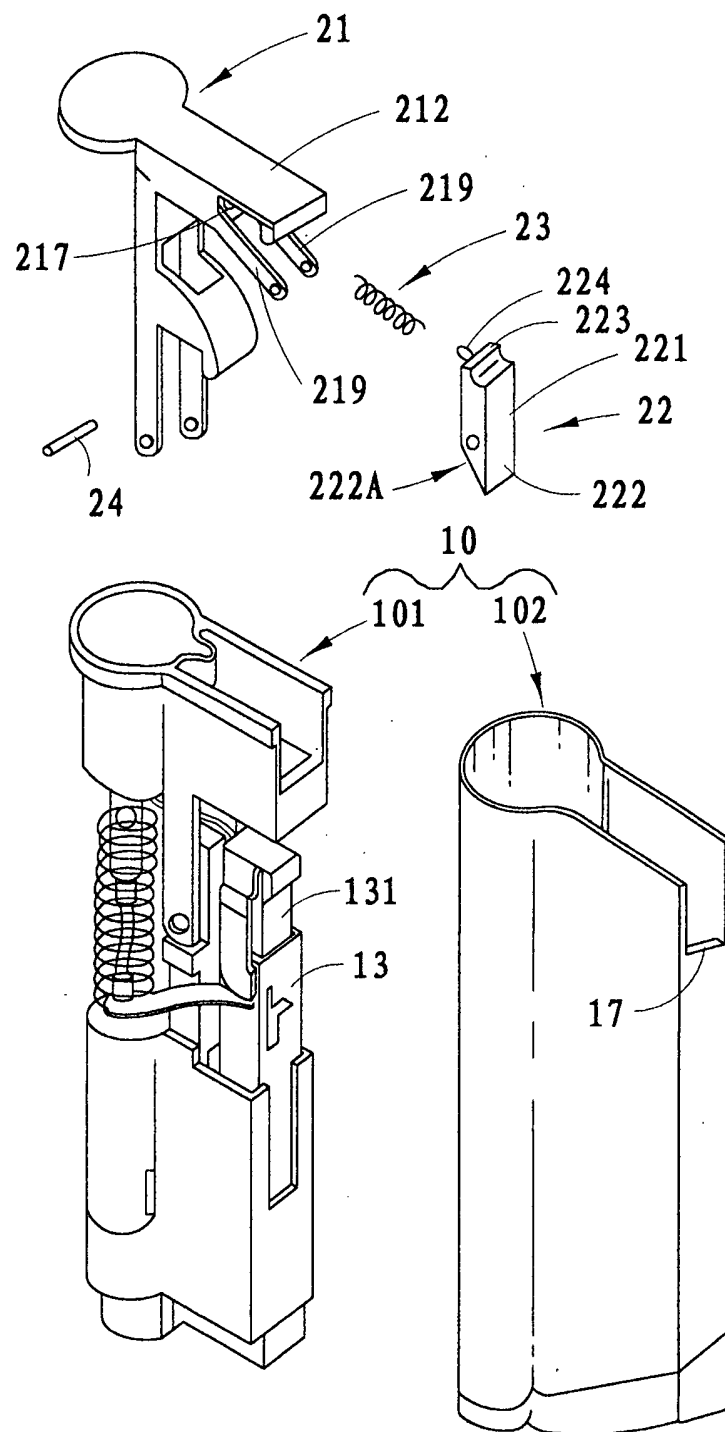


FIG. 6



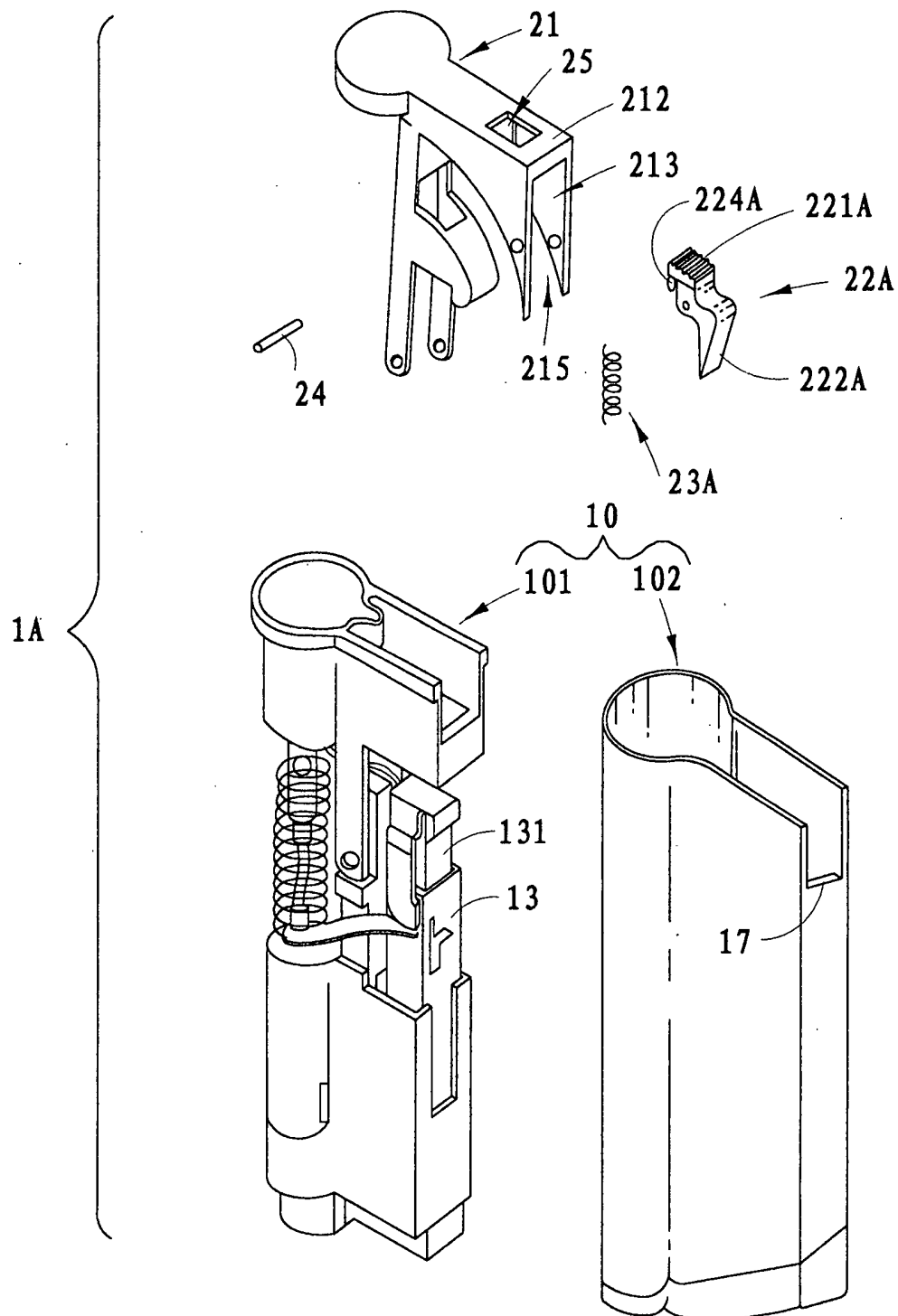


FIG. 7



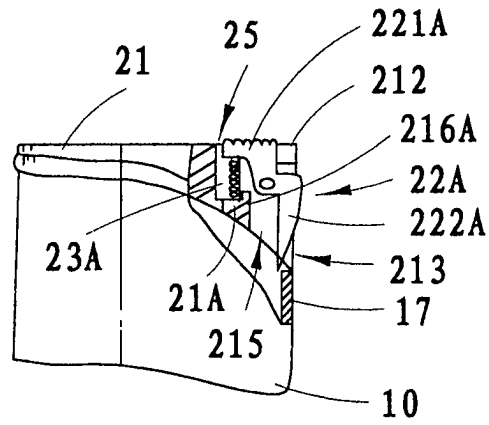


FIG. 8A

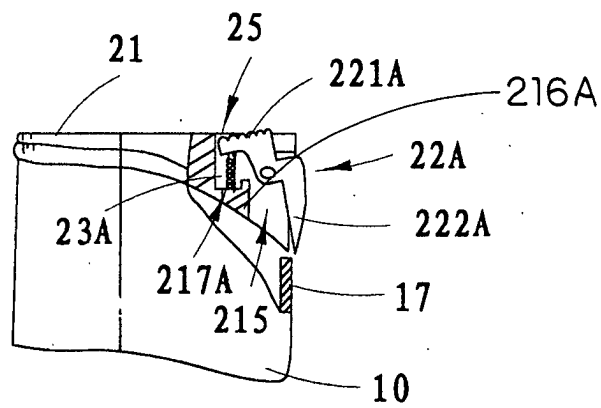


FIG. 8B

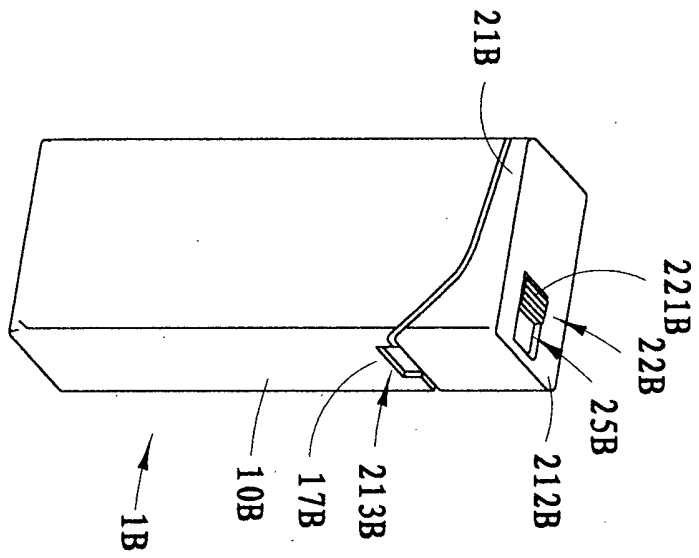


FIG. 9

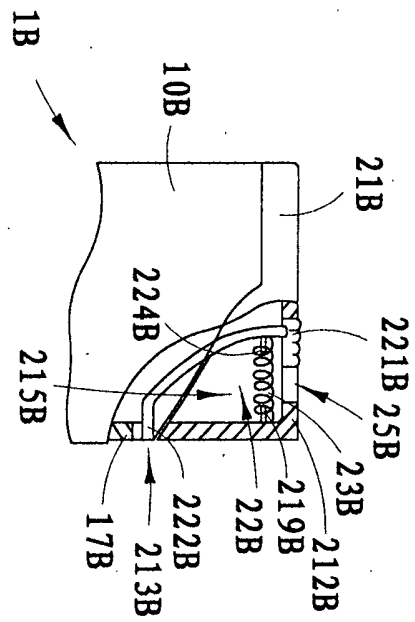


FIG. 10A

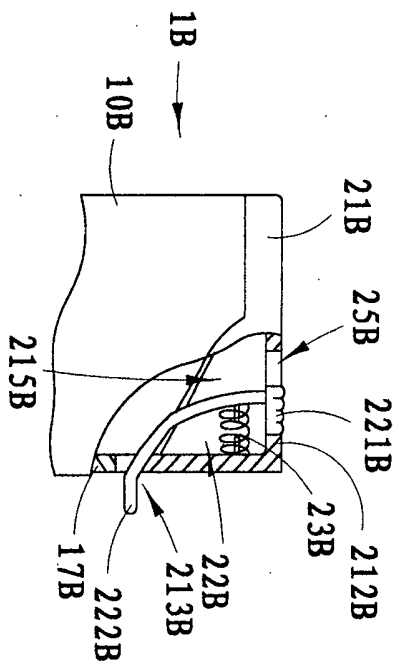


FIG. 10B

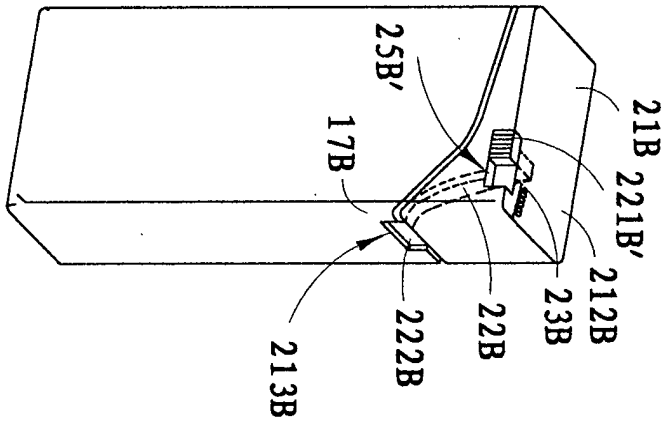


FIG. 12

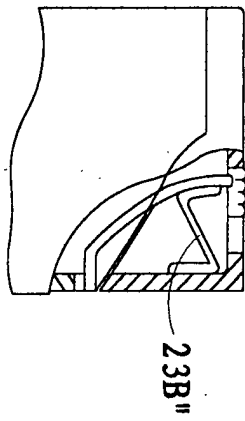


FIG. 11A

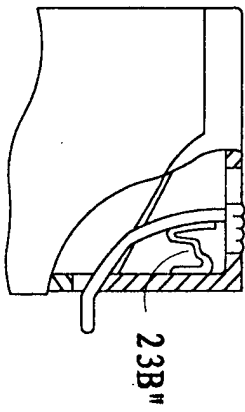


FIG. 11B

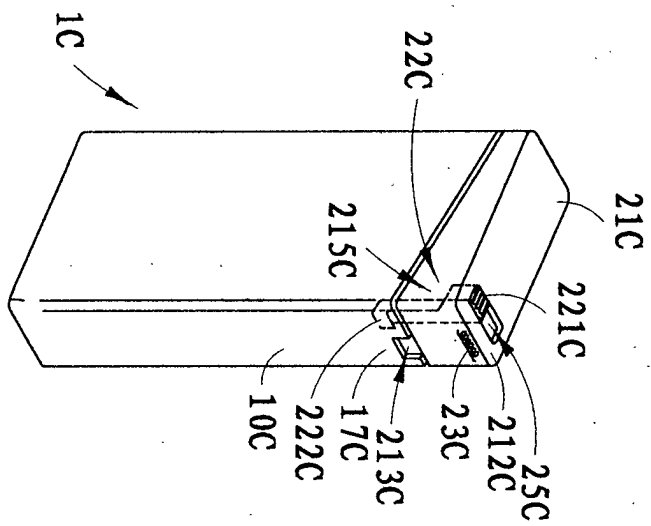


FIG. 13A

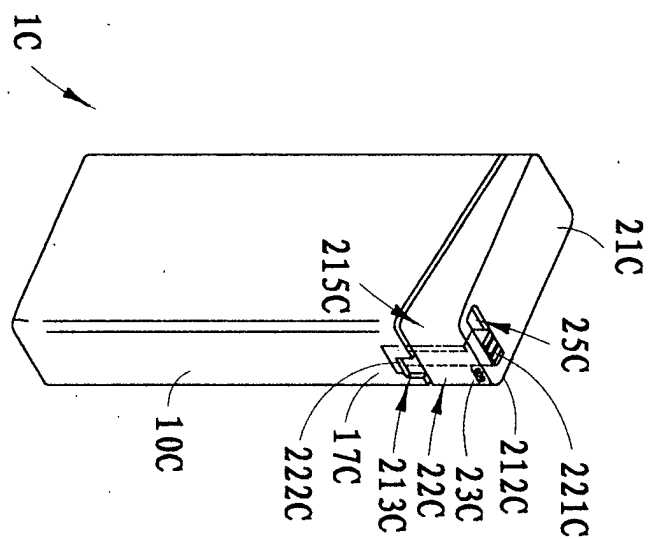


FIG. 13B