A child safe lighter is disclosed having an actuator that is designed to be operated by the thumb of a user and must be moved in an upward direction to operate the lighter. The actuator is biased in a downward direction using a force sufficient to make the necessary operational movement difficult for a child but relatively easy for an adult.
CHILD RESISTANT LIGHTER

BACKGROUND OF THE INVENTION

1. Technical Field

This invention relates to a lighter having an ignition system that is difficult for a user to operate inadvertently or unintentionally, and is particularly intended to be difficult for a child to operate.

2. Background Art

Lighters are convenient but dangerous tools. Typically, modern portable lighters have a gas or fuel reservoir and an ignition device that is easily operated by a lever. It is therefore important that lighters have a safety device which prevents them from being ignited inadvertently, for example by young children, or unintentionally by coming into contact with another substance. Essentially this requires a lighter that is not straightforward for children to operate. Therefore, there is a need for a lighter having an ignition system that has an actuation sequence which a child is unable to determine or requires a degree of dexterity that children do not usually possess.

Currently available devices that attempt to achieve this have shortcomings in that a lock mechanism, which prevents the depression of an ignition lever, must be released to allow the ignition lever to be depressed. Often the lock mechanism has to be manually returned to the locking position. It is, therefore, apparent that the use of the known lighters is rather inconvenient.

Another drawback of the known devices is that the ignition actuator member, which usually is provided at the top of a lighter body, is often designed to be depressed to discharge gas fuel stored in the lighter and to actuate the ignition mechanism. This downward pressing motion is a logical and natural action for young children to execute. In particular, children can sometimes ignite the lighter by placing the actuator on a floor, for example, and depressing the body of the lighter. The effectiveness of the safety device is, in other words, relatively low.

It is, therefore, an object of the present invention to provide a safety lighter, particularly a child resistant lighter, which will at least go some way toward overcoming the foregoing disadvantages or will at least provide consumers with a useful choice.

SUMMARY OF INVENTION

Accordingly, in a one aspect, the present invention provides a lighter that has a manually manipulable actuator, the actuator requiring an upward motion to ignite the lighter.

In the preferred form two consecutive motions are required for and these comprise movement in a horizontal direction and a vertical upward direction. In other embodiments a single upward movement, or three consecutive movements, are required to operate the lighter. The three movements are an upward movement, an inward movement toward the centre of the housing, and another upward movement.

The one or more movements are preferably performed by one finger, with the lighter being grasped by the remaining fingers in the hand. Thus the user’s other hand is free to perform other tasks.

The actuator is positioned to be manipulated by the thumb of a user, so that the user contacts part of the actuator with a thumb tip, or thumb nail, and extends the thumb to impart an upward linear motion to the actuator. The actuator is biased in a downward direction, so the necessary thumb movement requires a certain amount of strength, which children do not generally possess.

A housing is provided which contains a fuel supply. A valve releases fuel from the supply to an outlet at an upper end of the lighter.

The lighter includes an ignition mechanism to ignite the fuel supplied from the fuel supply. In the preferred form, this is a piezoelectric device, but alternative mechanisms, such as a flint or other electronic device may be used.

Movement of the actuator operates both the valve and ignition mechanism in the preferred embodiment, but could operate only one of these features.

The actuator is biased into a rest position remote from the upper end. The biasing force is selected to make the lighter difficult to actuate by a child, but relatively easy to actuate by an adult, and is preferably between approximately 5 to 25 Newtons, more preferably 10 to 20 Newtons, and most preferably approximately 17 Newtons.

The invention also consists in the parts, elements and features referred to or indicated herein, individually, collectively or in combination. Also, where elements or features are mentioned herein and which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth. Those skilled in the art to which the invention relates will see many variations not specifically mentioned herein which still come within the scope of the appended claims.

The invention consists of the foregoing and also envisages constructions of which the following gives examples.

DRAWING DESCRIPTION

Preferred forms of the present invention will now be described with reference to the accompanying drawings in which;

FIG. 1 is a perspective view of a gas lighter with a safety device in accordance with the present invention.

FIG. 2 is a perspective view of the interior components and construction of the gas lighter of FIG. 1.

FIG. 3 is a front elevation of the interior of the lighter of FIG. 1.

FIG. 4 is a cross-sectional view of the assembled interior of the lighter of FIG. 1.

FIG. 5 is a perspective view from below of a housing for part of the lighter of the preceding figures.

FIG. 6 is a perspective view of an assembly of the major components of the lighter of FIG. 1.

FIG. 7 is another perspective view of the assembled major components of the lighter of FIG. 1 with the inclusion of the housing of FIG. 5.
[0026] FIG. 8 is a partial side elevation of another embodiment.

[0027] FIG. 9 is a partial perspective view of the embodiment of FIG. 8, and

[0028] FIG. 10 is a sketch showing the general hand action required by a user to operate the lighter of the invention.

DETAILED DESCRIPTION

EXAMPLE ONE

[0029] Referring to FIG. 1, a gas lighter with a safety device in accordance with one embodiment of the present invention is shown generally referenced 1 having a body 2. The body 2 contains a number of the lighter components and also contains the fuel required for combustion which takes place during ignition. Abutting the body 2 is a housing 4 in which a slot 5 is provided to allow a user to access a surface 6 of an actuator. Appropriate movement of the actuator will ignite gas to produce a flame, as discussed further below. A part 8 of the housing 4 is formed with an aperture 10 from which the flame emerges in use. Embracing part 8 is an adjusting lever 12 which is provided for the control of the size of the flame.

[0030] Turning now to FIG. 2, a perspective view of the actuation components which are encapsulated by the body 2 and the housing 4 are shown. An actuator 14 which comprises a rectangular lug 16 and a U-shaped lever 18 is provided to activate the valve system, generally referenced 20, through an engaging means 22. As shown in FIG. 2, in-turned edges or teeth are provided on the outer surface 6 of the rectangular lug 16 so as to allow a user’s finger (not shown) to achieve a firm grip on the lug 16 in order to apply a force to actuate the lighter 1 as will be described further below. A wedge 24 is provided to assist in keeping a piezoelectric ignition device in place. A block 26 is provided at the top of the side 28 of the U-shaped lever 18. A U-shaped opening 30 is formed in the block 26 to receive an activator for charging the piezoelectric device. The top portion of the side 28 is widened outwardly in region 34 to form an upward facing shoulder 32. The shoulder 32 is provided to engage with the indentation 36 of the forked member 38.

[0031] L-shaped legs 40 and 44, which are provided at the other end of the forked member 38, are provided either side of elongate nozzle 42, and about a lower edge of a sleeve 44 which has a externally tapered top 46. The elongate nozzle 42 extends from valve system 20 which is cylindrical in shape. An annular ring 50, which possesses internal teeth 52, is provided on top of the valve system 20. The annular ring 50 is connected to the lever 12, which is provided for the control of the flow of the fuel to nozzle 42, and therefore the size of the flame.

[0032] Turning now to FIG. 3, the internal construction of the gas lighter 1 together with a piezoelectric ignition device is illustrated. It can clearly be seen in the assembly that a piezoelectric ignition device 56 is fitted into the trough of the U-shaped lever 18. The piezoelectric device 56, which is made up of four connected parts, is more clearly shown in FIG. 4. Referring to that figure the top section 58 of the piezoelectric device 56, which is cylindrical in shape, is connected to the rectangular main body 60. A movable block 62, which is located at the other end of the body 60, is provided telescopically and preferably biased away from the body 60 by a spring (not shown). In operation, when the block 62 is forced into the main body 60 of the piezoelectric material 56, the input kinetic energy gets converted into electrical energy which is utilised for the generation of a spark for ignition. In FIG. 4, it can also be seen that a protrusion 64, which has a shoulder 66, is provided as a switch for discharging the electrical charge that has been generated by movement of block 62. Therefore, depression of protrusion 64 results in a spark, as described further below.

[0033] Turning now back to FIG. 3, in operation, the actuator 14 has to be moved linearly upwardly for ignition to occur. In one preferred embodiment the location of lug 16 relative to the housing is such that the lug 16 has to be pushed upward slightly, then pressed inward and pushed upward as far as it will go again. The actions have to be carried out in sequence skillfully and continuously in order to ignite the lighter. It will be seen that the invention may be effected by a design that allows two movements rather than three, for example, inward then upward, or upward then inward. Another alternative is simply a single upward movement. In use, the motion and position of the entire U-shaped lever 18 is in step with the actuator 14. Consequently, the base 68 of the U-shaped lever will rise and force the block 62 into the main body 60 of the piezoelectric material 56. Simultaneously, the protrusion 64 will engage with the opening 30. In other words, the piezoelectric material will start discharging and at substantially the same time fuel will be present in the vicinity of nozzle 42.

[0034] The lighter is designed in such a way that it can hardly be ignited accidentally or unintentionally. Also, since the actuating procedures only involve upward actions, as opposed to a depressing action that a child would attempt naturally or habitually, the lighter may be considered to be child proof.

[0035] The housing 4 is viewed from below in FIG. 5. An elongate electrically conductive coil 68 is provided, extending from one side of the housing to somewhere above the centre of the aperture 10, where the combustion takes place. The coil 68 conducts the charge from the piezoelectric device, the charge in use being expended as a spark between the coil 68 and the nozzle 42 which is electrically connected to the other terminal of the piezoelectric device through forked element 38. The discharge path is shown by dashed line 67 in FIG. 3. Returning to FIG. 5, a slot 72 is provided at the other end of the housing 4 to receive the actuator 14, and it can be seen that the slot 72 includes a step, so that the lug 16 needs to be pressed inwardly over the step before it can be pushed upwardly to trigger the piezoelectric device. Also, as can be seen from FIG. 1, the lug is disposed in the inactive state such that its upper end sits below the end of the slot 5 in the housing 4. Therefore, a user firstly slides the lug 16 upwardly until the end of the slot is reached, then inwardly to surmount the step at the entrance to the slot 72, and then upwardly again to strike the flame. In the most preferred embodiment the actuating movement required is inward then upward movement i.e. the lug 16 being located proximate to the upper end of slot 5.

[0036] Returning to FIG. 5, engagement means 73, each having a barb portion 76, are also provided. The location of
circumferential shoulder 74 is such that it abuts the top surface of the base block 78, which in use is attached to the housing 4 as shown in FIG. 6. [0037] Referring to FIG. 6, a perspective view of the assembled major components of the lighter 1 is shown. The components of FIG. 3 are all supported by the base block 78 which is in turn attached to and supported by the housing 4. Slits are provided for engagement with the engagement means 73 which are shown in FIG. 5. The actuator 14 protrudes through, and is kept in position by, the slot 5 (refer to FIG. 1) which is provided at one end of the base block 78.

[0038] Turning now to FIG. 7, another perspective view of the assembled major components of the lighter 1 is shown with the inclusion of the housing 4. The housing 4 is secured onto the base block 78 by the engagement means 76, and shelters a significant part of the piezoelectric device 56. The elongate end of the housing 4 (i.e. the end shown by the horizontal arrow in the drawing) is semi-cylindrical in shape and an elongate slot (not shown) is provided therein to accommodate the actuator 14. A second housing, which consists of an elongate portion, and two concave guards 80 and 82, is also provided to define spaces above the remaining exposed part of the piezoelectric device 56 and the protruding portion of the valve system 20.

[0039] It should also be understood that encapsulating part 8 (which is shown in FIG. 1) defines a space above the valve system 20, where discharge and combustion take place.

EXAMPLE TWO

[0040] The operation of this embodiment is substantially the same as that with reference to FIG. 1 above, and the same reference numerals are used. The differences are illustrated in FIGS. 8 and 9. Referring to those figures, the output from the piezoelectric device 56 discharges through the conductive element 65, the discharge path being again represented by dashed line 67 in the drawings. A forked member 90 having legs 92 and 92' replaces the legs 40 and 40' of the previous example, and end 94 is retained in substantially the same position while the other end is moved upwardly in response to contact from member 26. Thus the member 90 moves pivotally about end 94 and lifts the nozzle as described above to dispense gas from the valve assembly at substantially the same time as the piezoelectric device discharges a spark.

[0041] A further change in this example is the grip pattern on outer surface 6 of the lug 16.

[0042] In the examples provided above, one skilled in the art will realise that the piezoelectric element may be replaced by a flint to provide the required spark. Thus, the lug 16 could instead extend across the lighter and be provided in connection with a metallic element having a suitably rough surface disposed adjacent to the nozzle to contact a flint located adjacent the nozzle. The lug 16 is again also connected to member 94 or member 38. A spring biases the lug in the downward position. Sliding upward movement of the lug causes movement of the metallic member relative to the flint to create a spark that ignites the fuel.

[0043] In all the examples provided, the main actuating movement required by a user is to exert an upward force on the lug. This will typically be done by a user placing a thumbnail or thumb tip on the outer surface of the lug to try to move the lug upwardly. This general action is shown in FIG. 10 where the user’s thumb is referenced 100, trying to move the lug in a direction shown by arrow 102. It is thought that this movement requires uses of one or more of the thumb extensor muscles. The upward force required to be exerted can be controlled by selecting the downward biasing force. This can be done by selection of the spring in the piezoelectric device, or any other biasing member such as a separate spring (for example the separate spring described above if a piezoelectric device is not used to create the spark). Our experiments have shown that there is a significant difference in the strength that a child’s hand can exert as compared with an adult using the thumb as shown in FIG. 10. Therefore, the biasing force can be easily selected to make it very difficult for a child to force the lug upwardly so as to actuate the lighter, but relatively easy for an adult to do so. We have found that a linear force of about 10 to 20 Newtons, and preferably around 17 Newtons, can satisfy our aim to make the lighter capable of use by a 50 kg female, but difficult for a male of 35 kg to use. A nine year old boy is typically about 35 kg.

[0044] Thus it can be seen that the invention provides a lighter which has an upward actuation movement that is contrary to the natural downward movement of known constructions. The lighter may have a single linear upward actuating movement, or a movement that requires more dexterity, such as an inward movement, followed by the upward movement. The finger particularly the thumb strength required to execute the movement is selected to make the lighter very difficult for a child to actuate. Therefore, the lighter has the advantage of being child safe, but convenient for an adult to use. Finally, the position of the actuating lug and the required force is such that inadvertent actuation is highly improbable.

We claim:

1. A lighter having:
a housing including a fuel supply,
a valve for supplying fuel from the fuel supply to a fuel outlet at an upper end of the lighter,
an ignition mechanism for igniting the fuel from the fuel supply,
an actuator mounted for movement relative to the housing, and upward movement of the actuator in a direction toward the upper end operating the valve and the ignition mechanism to operate the lighter.

2. A lighter as claimed in claim 1 wherein two consecutive movements of the actuator are required to operate the lighter.

3. A lighter as claimed in claim 1 wherein a movement in a direction substantially perpendicular to the direction of upward movement is also required in order to operate the lighter.

4. A lighter as claimed in claim 1 wherein a movement in a direction substantially perpendicular to the direction of upward movement and immediately prior to the upward movement is required in order to operate the lighter.

5. A lighter as claimed in claim 1 wherein movement of the actuator in a direction from outside the housing to inside the housing is required before the upward movement in order to operate the lighter.

6. A lighter as claimed in claim 1 wherein three consecutive movements including the upward movement of the actuator are required to operate the lighter.
7. A lighter as claimed in claim 1 wherein the actuator is biased into a rest position remote from the upper end by a biasing means.

8. A lighter as claimed in claim 7 wherein the biasing force is between substantially 10 and 20 Newtons.

9. A lighter as claimed in claim 1 wherein the actuator is positioned relative to the housing to be moved in use by the thumb of a user.

10. A lighter as claimed in claim 1 wherein the actuator is positioned relative to the housing to be moved in use by the thumb of a user and is biased into a rest position remote from the upper end by a biasing means and the biasing means is selected to provide a force sufficient to prevent the thumb of a child from operating the lighter, but allowing an adult to operate the lighter.