

[54] **PIEZO-ELECTRIC TYPE GAS LIGHTER**

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[51] Int. Cl. **F23q 2/08**

[58] Field of Search **431/130-132, 431/255**

[56] **References Cited**

UNITED STATES PATENTS

3,077,759	2/1963	Gladitz et al.	431/131
3,734,680	5/1973	Murayama	431/255
3,741,714	6/1973	Yoshinaga	431/255
3,756,767	9/1973	Ishiguro	431/255
3,764,256	10/1973	Moriya	431/255
3,814,571	6/1974	Goto	431/255

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[57] **ABSTRACT**

A piezo-electric gas lighter comprising a case having four side walls and a bottom wall with a through hole for a fixing screw formed integrally and provided with air hole near the upper opening thereof, and, a piezo-electric element unit and a tank inserted into said case. Said piezo-electric element produces discharge between electrodes with high voltages applied thereto when the piezo-electric element is struck with a moving member moving vertically and a hammer. Said tank is provided with a combustion valve on the top thereof and operating means and with a hole for a screw made at the same position as the through hole at the bottom of the case so that said tank may be fixed at the bottom to the bottom wall of the case with the screw.

6 Claims, 4 Drawing Figures

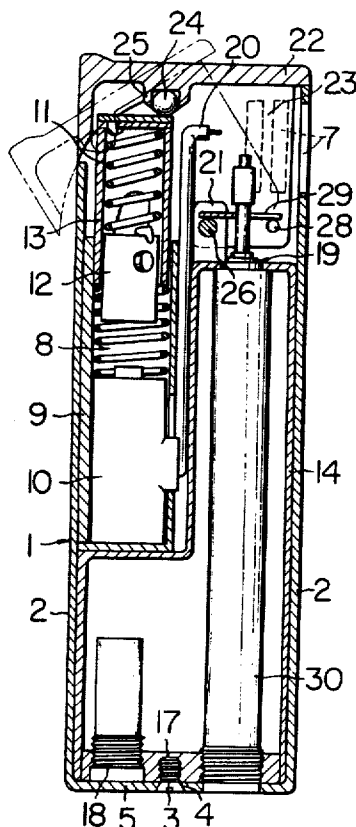


FIG. 1

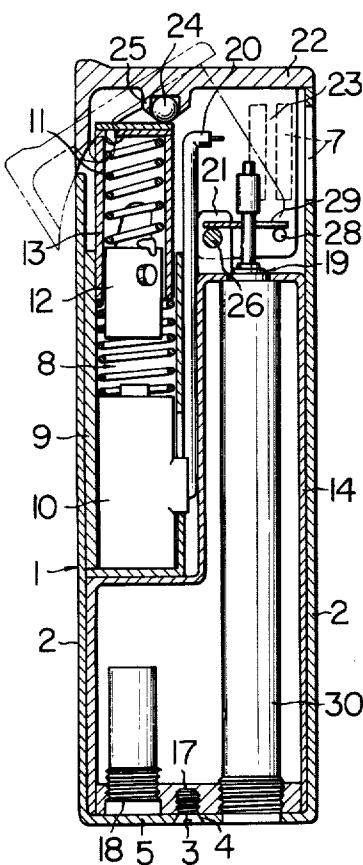


FIG. 2

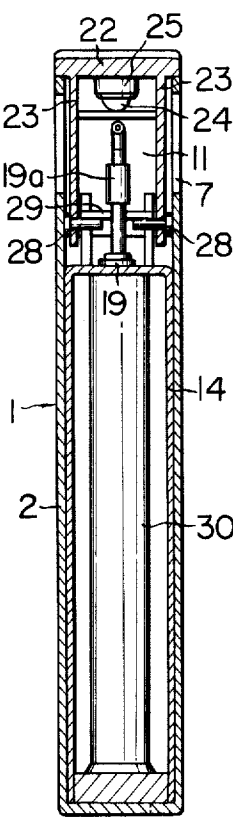


FIG. 3

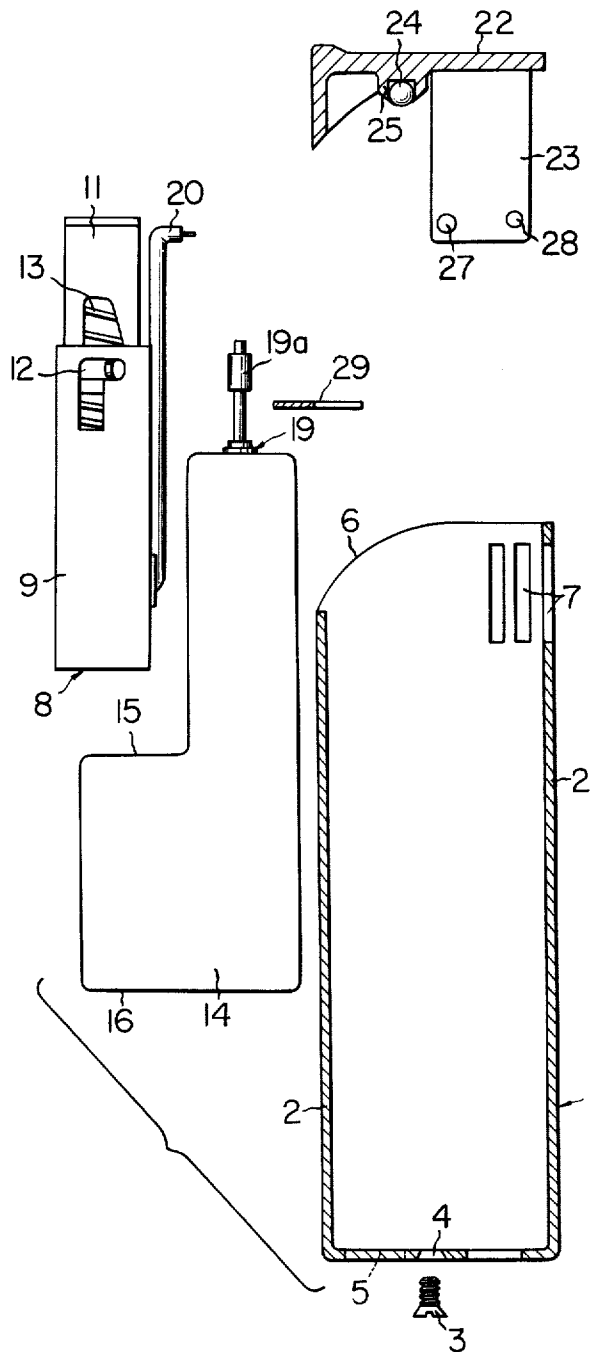
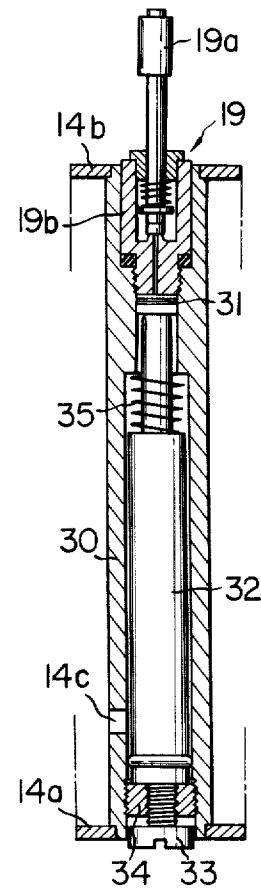


FIG. 4



PIEZO-ELECTRIC TYPE GAS LIGHTER

This invention relates to a gas lighter provided with an element for producing high voltage with high impact applied thereto and a unit for imparting such impact to the element.

One object of this invention is to provide a piezo-electric type gas lighter, so arranged that assembling and disassembling is very easily accomplished just by tightening and loosening a screw joining a fuel tank to a lighter case having an opening at the upper portion through which the tank is inserted together with a piezo-electric element unit and fixed to the case at the bottom.

Another object of this invention is to provide a piezo-electric gas lighter so arranged that a ball is used as a transmitting medium between a moving member and operating means on the top of the fuel tank for making the moving member operated smoothly in its linear vertical motion by the operating means which is turned around a shaft as a supporting point.

A still further object of this invention is to provide a piezo-electric gas lighter so arranged that a member for controlling a nozzle may be disposed very easily around a combustion valve in a narrow space enclosed by the case, where such a member is otherwise very difficult to mount.

Still another object is to provide a piezo-electric type gas lighter provided with a member for opening and closing an air hole made around the combustion valve on one side of the case as the operating means moves.

A still further object is to provide a piezo-electric gas lighter provided with a member for adjusting the combustion valve mounted on the top of the tank from the lighter bottom.

The piezo-electric gas lighter of this invention for achieving such objects as described above comprises a case having four side walls and a bottom wall formed integrally with an upper opening, tank and a piezo-electric element unit inserted into the case, and operating means supported on a shaft on the top of the tank, as main building members.

Referring now to the drawing, one embodiment of this invention will be explained in detail.

FIG. 1 is a front view of a lighter in vertical section;

FIG. 2 is a side view of the lighter showing the case and the operating means in vertical section at the side of a combustion valve;

FIG. 3 is a disassembled view of FIG. 1; and

FIG. 4 is a vertical sectional view of the combustion valve and its adjusting member mounted on a tank.

In the drawing, numeral 1 represents a lighter case, which is shaped like a rectangular box having four side walls 2 and a bottom wall 5 with a through hole 4 made at the center and the upper opening edge 6 arcuated at the left and provided with a plurality of air holes 7 at the right along the edge.

Numeral 8 represents a piezo-electric element unit having a fixed member 9 like a square post with a similar moving member 11 inserted therein movably up and down. In the lower space of the fixed member 9 is fixed a piezo-electric element 10 with leads, which is insulated with coating. A hammer 12 is provided over the piezo-electric element 10 at a proper distance therebetween for its action of impact. The hammer 12 has a projection held on the shoulder of an L-shaped slot made on the fixed member 9 through a window pro-

vided within and on the side of the moving member 11. A helical spring 13 is provided for imparting such impact between the hammer 12 and the moving member 11.

Numeral 14 represents a tank for fuel having a portion of almost the same cross area as that of the inside of the case 11. The tank has a stepped portion 15 on which the piezo-electric element unit 8 is mounted at the left and a screw hole 17 made at the bottom 16 so as to meet the through hole 4 and a top portion on which an adjuster for the combustion valve 19 is mounted. On the top of the tank is also provided a receiving piece 21 supporting the combustion valve 19 and the operating means 22 rotatably together with an electrode 20 for discharge, which is connected to the leads.

The operating means 22 consists of a lid to cover the opening of the case over the combustion valve 19 and a finger pressing portion formed integrally. The finger presser is supported on the receiving piece 21 through a pair of supporting pieces 23 provided vertically on the both sides of the lid at the side of the arcuated edge. A ball 24 mounted on the back of the finger presser is kept in contact with the top plate of the moving member 11. The ball 24 is set rotatably in a holder 25 projecting from the back of the finger presser. When the means 22 is moved to make the lid open on a shaft 26 of the receiving piece 21 as a supporting point, the ball pushes down the moving member 11, rolling on the top flat plate from end to end. In the moving member 11 thus pushed down with the ball 24 the spiral spring 13 is first compressed with the hammer 12 held on the shoulder of the L-shaped groove, and applies its elastic energy to the hammer 12. The hammer 12 is then released from the shoulder because of the upper tapered portion of the window for the moving member 11, and strikes against the piezo-electric element 10 with the resilient force of the spiral spring 13. As a result, voltage is produced which is high enough to start discharge between a nozzle 19a and an electrode 20.

Under the supporting piece 23 is provided a pair of projections 28 inward as high as a shaft hole 27 through which the shaft 26 passes. The nozzle 19a is disposed between the projections 28 and the shaft 26. A nozzle control plate 29 is provided on the projections 28 by setting it into the neck of the nozzle 19a. When the projections 28 are moved upward together with the supporting piece 26 arranged integrally with the operating means 22 with the shaft 26 as a supporting point, the neck of the nozzle 19a is pushed up so as to let liquified gas fuel flow out by opening the combustion valve 19.

The combustion valve 19, as shown in FIG. 4, has a tubular body 30 extending from a bottom plate 14a to a top plate 14b, a valve body 19b incorporating valve means at the lower end of the nozzle 19a and being screwed into the upper portion of the tubular body 30 so as to contact fuel control material 31 at the bottom, an adjusting shaft 32 pressing variably against the fuel control material 31 at the top, and an adjusting screw 33 in contact with the lower end of the adjusting shaft 32. Below a fuel inlet 14c formed in the lower portion of the tubular body 30 is provided a nut 34 engaged with a thread made on the lower inside of the tubular body 30 and serving as a receiving member for an adjusting screw 33. This nut 34 can be adjusted to a certain depth as required so as to preset the position of the adjusting screw 33 by compressing or loosening the

combustion control material. Numeral 35 represents a helical spring for returning the screw.

With such arrangement of the lighter as described above, the operating means 22 may be supported on the shaft on the top of the tank 14, and the piezo-electric element unit 8 may be inserted into the case 1 through the upper opening along the side faces of the tank 14. Such individual members incorporated are fixed by fastening the screw 3. In this manner, it is easy to construct and disassemble the lighter. Furthermore, the piezo-electric element unit 8 can be activated and the combustion valve 19 can be opened just by pushing down the finger presser of the operating means. Through the intermediate ball 24, the operating means and the moving member 11, which move in different directions, are ensured for their proper functions, causing very little loss in force due to frictional resistance. Thus positive lighting is achieved just by pressing down the operating means 22 lightly.

What is claimed is:

1. A piezo-electric gas lighter comprising:

a housing having four side walls, a bottom wall with a hole therein, and an open top;

an L-shaped fuel tank, the lower, wider, transverse portion of which fits within the bottom inside of said housing, said fuel tank having projections extending from the top thereof and a screw hole in the bottom in alignment with said hole in said bottom wall of said housing;

a combustion valve having a tubular body mounted within the elongated portion of said fuel tank and having a valve body extending through the top of said fuel tank adjacent said projections;

operating means having an L-shaped configuration and being pivotally mounted to said projections, said operating means also serving as the cover of said lighter housing when in its normal position with respect to said housing;

means coupled between said operating means and said combustion valve to permit fuel to flow out of said valve when said operating means is pivoted away from its normal position;

a piezo-electric element positioned on the stepped portion of said fuel tank and extending upward therefrom adjacent and parallel to said elongated portion of said fuel tank, said piezo-electric element having a top plate, said operating means, when in its normal position, having its elongated portion extending across the top of said piezo-electric element and its short transverse portion extending down the side of said piezo-electric element past the top thereof, thereby coupling said piezo-electric element, said fuel tank and said operating means together as a unit;

said operating means having means for engaging said top plate of said piezo-electric element for actuation of said piezo-electric element by depression of said top plate to produce an electrical discharge simultaneously with the flow of fuel from said combustion valve to ignite said lighter when said operating means is pivoted away from its normal position;

tion; and

a screw for removably securing together said housing with the unit comprising said piezo-electric element, said operating means and said fuel tank by passing through said hole in said bottom wall of said housing and engaging said screw hole in the bottom of said fuel tank.

2. A lighter according to claim 1 wherein said housing includes air holes through at least one of the side walls thereof adjacent a top corner of said housing; and wherein said operating means is formed with opaque support pieces which pass between said valve body and said air holes when said operating means is in its normal position, thereby occluding said air holes;

said air holes being adjacent the nozzle of said combustion valve and being exposed to the interior of said housing when said operating means is pivoted away from its normal position.

3. A lighter according to claim 2 wherein the top corners of two opposite side walls of said housing are rounded adjacent the opposite top corner from said air holes, said operating means having a rounded portion configured to operatively engage said rounded corners of said side walls, said rounded corners being concentric with the pivot of said projection from said fuel tank, said operating means sliding around said rounded surfaces of said side walls when pivoted away from its normal position to operate said lighter.

4. A lighter according to claim 1 in which the operating means consists of a lid and a finger presser formed integrally, said lid having vertical supporting pieces on the both sides under which a pair of projections are provided as high as shaft holes on said supporting pieces and said projections through which pass a shaft, and is supported rotatably on the shaft over the tank, and a member for opening and closing the nozzle is provided between the shaft and said projections.

5. A lighter according to claim 1 in which a ball rolling along the top plate of the moving member is used as a transmitting means between the operating means and the piezo-electric element unit.

6. A lighter according to claim 1 wherein said tubular body of said combustion valve is fixed between the bottom and top plates of the tank and has a fuel inlet in the lower portion, said valve body having valve means therein and a nozzle mounted so as to be free to move up and down, said valve means being screwed into the upper portion of said tubular body so as to contact a fuel control material at the bottom thereof, said valve means having an adjusting shaft inserted from the bottom for compressing said fuel control material variably at the top thereof and an adjusting screw for operating said adjusting shaft, the adjusting shaft and the adjusting screw being interconnected by engagement of the adjusting screw with a nut provided for preventing the adjusting shaft from falling, said nut being engaged with threads made on the inner lower wall of the tubular body at the lower end of the adjusting shaft.

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