Sept. 9, 1969 SHIGERU OCHIAI 3,466,474

PIEZOELECTRIC IGNITION ELEMENT WITH AN ACTUATOR

Filed Sept. 26, 1967

Fig. 1

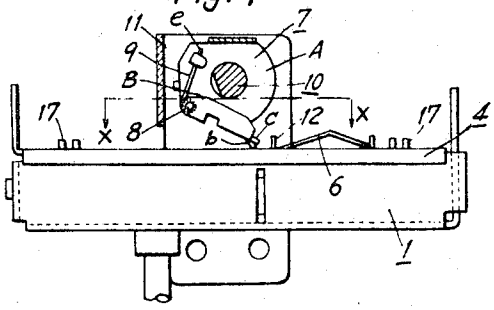


Fig. 2

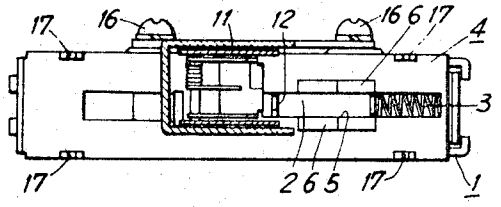


Fig. 3

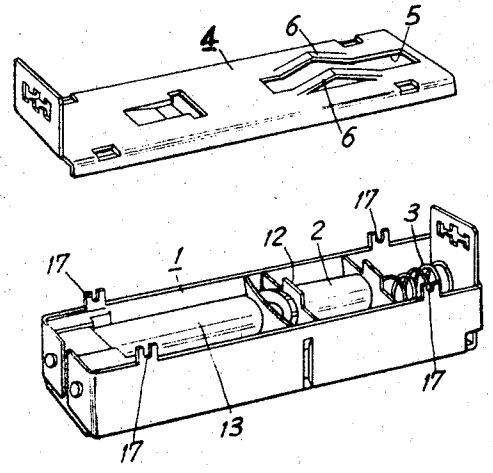
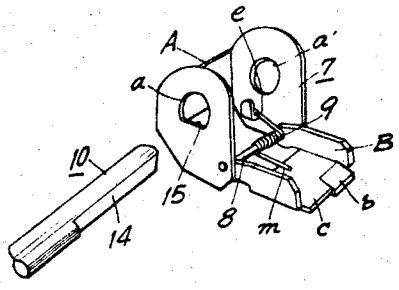


Fig. 4



United States Patent Office

3,466,474
Patented Sept. 9, 1969

3,466,474

PIEZOELECTRIC IGNITION ELEMENT WITH AN ACTUATOR

Shigeru Ochiai, Neyegawa, Japan
(4–10 Minami, Shinmorishoji, Asahi-ku, Osaka, Japan)

Filed Sept. 26, 1967, Ser. No. 670,728
Int. Cl. H01v 7/00
U.S. Cl. 310—8.7 1 Claim

ABSTRACT OF THE DISCLOSURE

An actuator for a piezoelectric ignition device in which rotation of a shaft moves a pawl against a linearly movable beater to shift the beater and compress a spring, the pawl cooperating with a cam that frees the beater upon upon continued rotation of the shaft whereupon the beater strikes a piezoelectric element to cause ignition.

DESCRIPTION OF THE INVENTION

This invention relates generally to piezoelectric ignition devices and more particularly concerns such a device which is actuated by rotating a shaft.

The primary aim of the invention is to provide a piezoelectric ignition device which can be actuated upon rotation of a shaft in one direction. Thus, the device can be associated with the control shaft of a gas valve and affect ignition incident to turning on the gas.

Another object of the invention is to provide a device of the above kind which is economical to manufacture, being simply formed of sheet metal parts, and yet completely reliable in operation.

A further object is to provide a device of the above character which is well suited for small, compact construction.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawing, in which:

FIGURE 1 is a side elevation, partially in section, of an ignition device embodying the invention;

FIG. 2 is a plan, partially in section along the line X—X in FIG. 1, showing the device of FIG. 1;

FIG. 3 is a partially exploded perspective of a portion of the device shown in FIG. 1; and

FIG. 4 is an enlarged exploded perspective of a portion of the device shown in FIG. 1.

While the invention will be described in connection with a preferred embodiment, it will understood that I do not intend to limit the invention to that embodiment. On the contrary, I intend to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

Turning to the drawing, there is shown an ignition device constructed in accordance with the invention and including a casing **1** which contains a beater **2**, a spring **3**, and a piezoelectric element **13** positioned adjacent the beater **2**. The casing **1** has a cover **4** which is formed with a slot **5** which overlies the beater **2**. The cover **4** is also formed with cams **6** at each side of the slot **5**. Preferably, the cams **6** are formed by deflecting the sheet metal of which the cover **4** is made. The cover **4** is fixed

to the casing **1** by means of fork-shaped projections **17** on the casing which are received through suitably shaped apertures at the corners of the cover.

The piezoelectric element **13** is fixed within the casing **1**. The beater **2** slides longitudinally of the casing and is guided by the fitting of projections, such as the projection **12**, in the slot **5** and in a similar slot formed in the bottom of the casing. Movement of the beater **2** toward the right in the drawing compresses the spring **3** and, if the beater **2** is released with the spring **3** compressed, the spring drives the beater towards the left so that it strikes sharply the piezoelectric element **13** thereby creating an ignition spark.

In accordance with the invention, the beater **2** is operated by rotating a shaft **10** which is rotatably mounted in a frame **11** that is fixed to the casing **1** by means of a pair of screws **16**. Mounted on the shaft **10** is a pusher **7** which includes a body A formed of sheet metal bent into a U and a pawl B which also, preferably, is a U-shaped piece of sheet metal. The pawl B is rotatably secured on the body A by a rod **8**, and a torsion spring **9** having opposite ends *e* and *m* urge the pawl B about the rod **8** against the cover **4**. The shaft **10** fits through apertures *a* and *a'* in the body A, and a flatted portion **14** on the shaft **10** rests against a segment **15** at one edge of the aperture *a* so as to lock the body **7** for rotation with the shaft **10**.

Preferably, the pawl B has a leading edge *c* of which a portion is bent downwardly to define a tab *b*.

In operation, rotation of the shaft **10** counterclockwise as seen in the drawings carries the pawl B to the right so that the leading edge *c* engages the beater projection **12**. Continued rotation of the shaft **10** causes the pawl to move the beater **2** to the right, thereby compressing the spring **3**. Continued movement of the pawl caused by still further rotation of the shaft **10** brings the tab *b* onto the underlying cam **6** and thus, as the pawl continues to move to the right, it is lifted by the cam **6** so that the leading edge *c* clears the projection **12**, whereupon the compressed spring **3** drives the beater **2** to the left so that the piezoelectric element **13** is struck to generate the desired ignition spark.

It will be seen that the parts of the ignition device described can be economically formed of sheet metal, and the simple operation of the device insures reliable operation through a long life. Rotation of the shaft **10** can be by any convenient means such as a manual knob fixed to the shaft. In a simple gas-fired device, the shaft **10** can be associated with the gas control valve so that rotation of the shaft both opens the valve and, in a manner described above, causes the device illustrated to ignite the gas thereby initating operation.

I claim as my invention:

1. In an ignition device comprising, in combination, a casing, a piezoelectric element in said casing, a beater mounted in said casing for linear movement toward and away from said piezoelectric element, a spring in said casing urging said beater against said piezoelectric element, a frame attached to said casing, a shaft rotatably mounted in said frame, a body mounted on said shaft for rotation therewith, a pawl pivoted on said body and biased against said casing, a projection on said beater which projects from said casing into the path of said pawl as the latter is swung upon rotation of said shaft whereby

rotation of the shaft causes the pawl to move the beater and compress the spring, and a cam formed on said casing which lifts the pawl against its bias from said projection for releasing said beater from said pawl when the spring is compressed so as to cause the beater to strike the piezoelectric element. to generate an ignition spark.

References Cited

UNITED STATES PATENTS

2,717,916	9/1955	Harkness	310—8.7 X
3,200,295	8/1965	Owens et al.	310—8.7 X
3,307,053	2/1967	Furth	310—8

FOREIGN PATENTS

712,803	7/1954	Great Britain.

VOLODYMYR Y. MAYEWSKY, Primary Examiner

U.S. Cl. X.R.

102—70.2; 317—81