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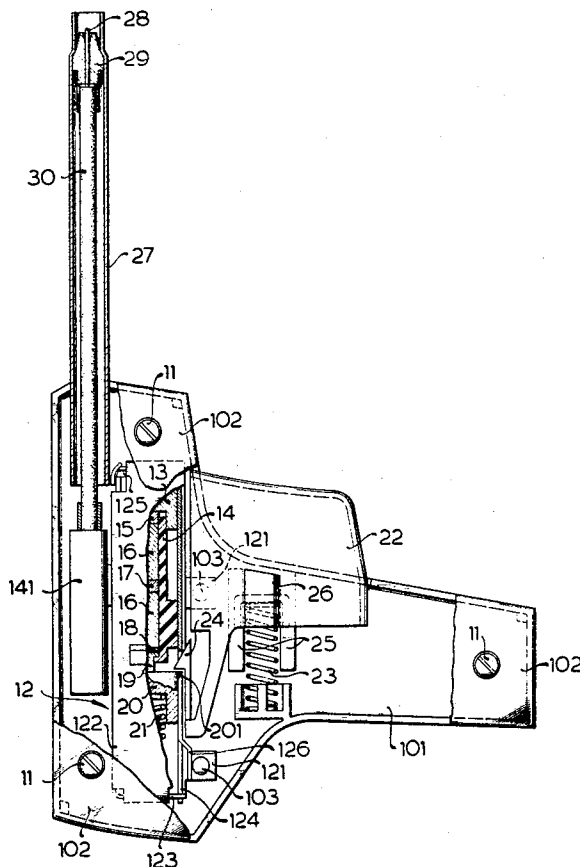
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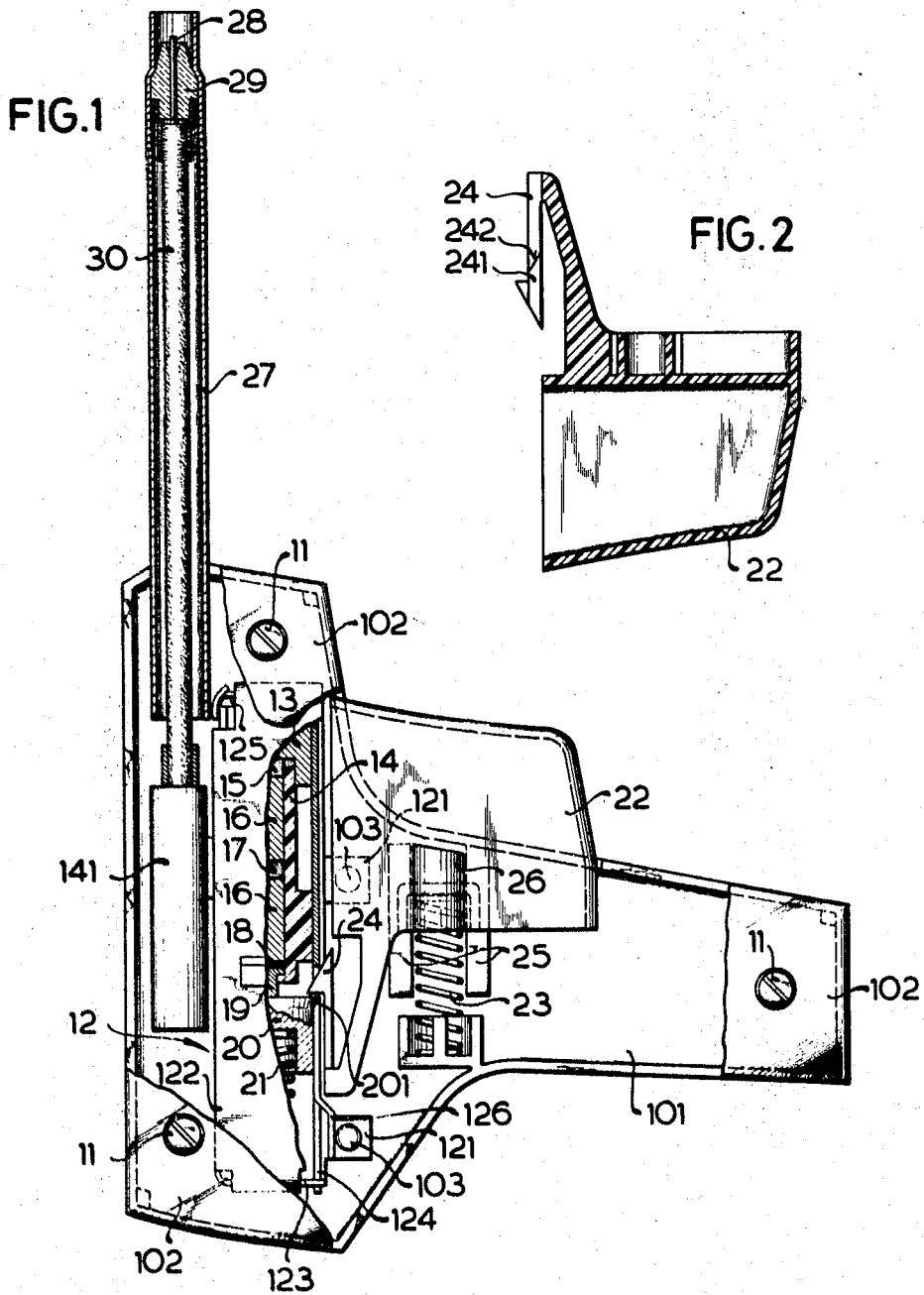
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[54] **MANUALLY OPERABLE PIEZOELECTRIC GAS IGNITER**
 10 Claims, 1 Drawing Fig.

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ABSTRACT: A pistol-shaped manual igniter having a striker cocked by a manual trigger which is displaced by a cam to release the cocked striker so that the same strikes a piezoelectric element from which electric energy is conducted to an igniting electrode at the end of a barrel.





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MANUALLY OPERABLE PIEZOELECTRIC GAS IGNITER

BACKGROUND OF THE INVENTION

The French Pat. 1,488,614 discloses a manual pistol-shaped gas igniter provided with a piezoelectric igniting means. The piezoelectric element consists of a plastic gelatinous mass of high viscosity whose volume is compressed by means of a piston, and which assumes the original volume when the pressure ceases. This apparatus requires a very high pressure on the piezo element for generating sufficient energy assuring a good spark. The pressure on the piezoelectric element is either mechanical by means of toggle lever linkages, or hydraulic, or pneumatic, and in any event requires a rather complicated structure which is expensive to manufacture and causes, sometimes, difficulties regarding leakage due to insufficient sealing.

SUMMARY OF THE INVENTION

It is one object of the invention to overcome the disadvantages of manual gas igniters according to the prior art, and to provide a gas igniter which has a simple structure and produces the same high igniting energy during a long span of life.

Another object of the invention is to generate electric energy in a manual gas igniter by striking a piezoelectric element whose energy is transmitted to an igniting electrode.

Another object of the invention is to provide a pistol-shaped manual gas igniter of simple construction which has a long span of life, and is inexpensively manufactured.

With these objects in view, one embodiment of the invention comprises casing means, preferably including two symmetrical casing halves abutting each other; piezoelectric means and biased striker means mounted in the casing, preferably in a housing supported on one of the casing halves and being movable between a cocked retracted position and a released position abutting the piezoelectric means; trigger means mounted in the casing means for movement from an inoperative position to a coupling position engaging the striker means in the released position, and to a cocking position in which the striker means is in the cocked retracted position; actuating means, preferably a stationary cam, causing the trigger means in the cocking position to release the striker means so that the latter moves to the released position; and igniting electrode means mounted on the casing means, preferably at the end of a barrel between the two casing halves, and electrically connected with the piezoelectric means.

When the piezoelectric means, which preferably includes an anvil, a striker pin, and a piezoelectric element between the same, is struck, electric energy is generated which is transmitted to the igniting electrode and causes a spark by which gas can be ignited.

In the preferred embodiment of the invention, the striker means include a spring-biased striker hammer cooperating with a striker pin, and having a lateral projection projecting through a slot out of a housing enveloping the piezoelectric means and the striker means.

The trigger means includes a finger-engaging portion projecting out of the casing, and a coupling part resiliently connected with the finger-engaging part and being preferably a resilient arm with a hook at the end thereof cooperating with the coupling projection of the striker hammer. The cam by which the coupling part of the trigger means is resiliently displaced to release the coupling projection of the striker hammer, is preferably a portion of the housing enveloping the striker means and the piezoelectric means.

The trigger means and the striker hammer are biased by springs. The spring of the striker hammer is biased in the cocked position of the same, and the spring of the trigger means is biased when the trigger is operated, and tends to move the trigger means back to its normal inoperative position.

The manual gas igniter according to the invention has a very simple mechanism for actuating the piezoelectric igniting means, which is also of very simple construction. The casing of the device preferably consists of an insulating plastic material, so that there is no danger of electric shock which is of importance particularly for housewives who may have a prejudice against manual gas igniters due to ignorance of piezoelectric energy.

Due to the use of piezoelectric means for creating the energy for the spark, sufficient ignition energy is generated even for types of gas which are difficult to ignite. Consequently, the apparatus of the invention is particularly suitable for igniting large amounts of gas, as is necessary in a baking oven or in a broiler. An additional advantage is that it is not necessary to ignite large amounts of gas by an open flame such as by using a match, in which event the possibility of burning the hand inserted into the oven or broiler cannot be excluded.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view, partially in section, with the front wall partly broken off for the sake of clarity, and illustrates a preferred embodiment of the invention; and

FIG. 2 is a sectional view illustrating the trigger used in the embodiment of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A pistol-shaped casing 10 consists of two casing halves 101 and 102 which preferably consist of an insulating synthetic material, and are mirror symmetrical to each other. A plurality of screws 11 secures the two casing halves 101 and 102 to each other in a position in which the inner rims of the same abut each other. A barrel 27 is clamped between the two casing halves 101 and 102 and completes the pistol-shape of the device. The rims of the two casing halves also form an opening through which a finger-engaging portion 22 of a trigger means projects so that the device can be easily held in one hand and operated by pressure on the finger-engaging portion 22, as will be described hereinafter in greater detail.

The housing 12 of the piezoelectric means has a rear wall, not visible in the drawing, from which lugs 121 projects which are mounted on pins 103 projecting from the casing half 101. The rear wall of housing 12 abuts the inner surface of casing half 101. This rear wall, not shown, is a portion of a U-shaped folded sheet which also forms the front wall 122 and a bottom 123 of the housing 12. Another housing part consisting of sheet metal forms the fourth wall 124 with a cover portion 125 whose left end is visible in FIG. 1. Within housing 12, which is formed by the two stamped metal sheet parts, an anvil 13, and a holding means 14 are mounted. Within holding means 14 which preferably consists of insulating synthetic material, a metal end plate 15, two opposite piezoelectric crystals 16, a conductor plate 17 between the piezoelectric crystals 16, and a metal end plate 18 with a striker pin 19 resting thereon, are disposed.

Holding means 14 has a lateral projection 141 with a connector for conducting piezoelectric energy away from the piezoelectric element 16. Housing 12 further envelops a striker hammer 20 which normally abuts striker pin 19, and has a lateral coupling projection 201 projecting out of housing 12 through a slot in wall 124. When a force acts on coupling projection 201, striker hammer 20 is displaced from its normal released position and moved to a cocked retracted position in which the striker spring 21 is tensioned, the striker spring 21

being arranged between the end of striker hammer 20 and the wall portion 123 of housing 12. The direction in which striker hammer 20 is cocked, and the direction in which it performs the stroking movement are opposite, so that when striker hammer 20 is moved from the released position abutting the striker pin 19 to the cocked position compressing striker spring 21, release of striker hammer 20 causes movement of the same to the released position in which the hammer 20 exerts a blow on striker pin 20 and through the same on piezoelectric element 16 which is supported by anvil 15 in housing 12.

The cocking force for the striker means is supplied by trigger means including a finger-engaging portion 22 projecting out of the casing 101, 102, a trigger spring 23, and a coupling part 24 which has a hook-shaped end portion with a face or shoulder abutting the leading front end of striker hammer 20. Coupling arm 24 is resilient and integral with finger-engaging portion 22, but it is possible to mount a coupling part on the finger-engaging portion 22 by resilient means.

The inner surfaces of the casing halves 101 and 102 are provided with pairs of guide bars 25 which are parallel to the longitudinal direction of the housing 12 and barrel 27 for guiding the finger-engaging portion 22 by means of projections 26 on the same.

As shown in FIG. 2, the rear face of the hook portion of coupling arm 24 has a cam follower projection 241 with a slanted face 242 which cooperates with a cam portion 126 formed on wall 124 of housing 12.

In the proximity of the outer free end of barrel 27, an igniting electrode 28 is mounted on an insulating body 29 by which the igniting electrode 28 is centered in the barrel insulated from the same. The connector 141 of the holding means 14 is connected with igniting electrode 28 by a cable or other conductor 30 so that electric energy generated in the piezo-electric element 16 can flow to the igniting electrode 28.

When the two casing halves 101 and 102 are connected by screws 11, the inner end of barrel 27, and also housing 12 are clamped between the two casing halves and fixedly positioned by the same. The finger-engaging member 22 is not clamped, but projects through an opening in the lateral portions of the casing halves 101 and 102, and is guided by guide means 25, 26 for sliding movement.

Barrel 27 may be provided with a flange located in a circular groove formed by casing halves 101, 102, not shown, so that the barrel cannot be moved in axial direction, and the connector 30 is protected.

When manual pressure is exerted on the finger-engaging part 22 of the trigger means, the same moves from the normal inoperative position assumed due to the action of spring 23 directly to a coupling position in which the hook of coupling arm 24 engages the striker hammer 20. Further pressure on finger-engaging parts 22 moves striker hammer 20 out of its normal released position abutting striker pin 19 to a retracted cocked position in which striker spring 21 is compressed. When spring 21 is fully cocked, and trigger means 22, 24 has arrived at a cocking position, a camming portion 126 of wall 124 engages the slanted face 242 on the cam follower portion 241 of coupling part 24, see FIG. 2, so that the hook of coupling arm 24 is pushed off the end face of striker hammer 20 so that the same is released and moves under the action of striker spring 21 at high speed toward the striker pin 19 and finally strikes the same so that the striker pin 19 through member 18 exerts a blow against piezoelectric element 16 which is supported at the other end of the housing by the anvil 15.

The blow on the piezoelectric element 16 generates piezoelectric energy which is transmitted through conductor 30 to the igniting electrode 28 so that between the point of the same and the outer rim of the metal barrel 27 sparks are created which can be used for igniting gas when the outer end of barrel 27 with electrode 28 is placed in the proximity of a nozzle supplying gas.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of manual gas igniters differing from the types described above.

While the invention has been illustrated and described as embodied in a pistol-shaped manual gas igniter having piezoelectric means and an igniting electrode connected with the same, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims. What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. Manual gas igniter comprising casing means including two casing parts abutting each other, and means detachably securing said casing parts to each other to form a cavity; piezoelectric means mounted in said casing means; biased striker means mounted in said casing means for movement between a cocked retracted position and a released position abutting said piezoelectric means; trigger means mounted in said casing means for movement from an inoperative position to a coupling position engaging said striker means in said released position, and to a cocking position in which said striker means is in said cocked retracted position; actuating means for causing said trigger means in said cocking position to release said striker means so that the latter moves to said released position and strikes said piezoelectric means so that the same generates electric energy; and igniting electrode means mounted on said casing insulated from the same and electrically connected with said piezoelectric means for converting the electric energy of the same into an igniting spark.

2. Manual gas igniter as claimed in claim 1 wherein said casing parts are symmetrical halves and said casing means is pistol shaped; and comprising spring means in said cavity for biasing said trigger means toward said inoperative position; and a barrel mounted between said casing halves and supporting at the free end thereof said igniting electrode means.

3. Manual gas igniter as claimed in claim 1 wherein said piezoelectric means include an anvil, a striker pin, and a piezoelectric element between said anvil and said striker pin; and wherein said striker means include a striker hammer and a striker spring biasing the same, said striker hammer being biased to said released position by said striker spring, and striking said striker pin in said released position under the action of said striker spring.

4. Manual gas igniter as claimed in claim 1 wherein said trigger means includes a finger-engaging part and a coupling part resiliently connected with said finger-engaging part, said coupling part in said coupling position engaging said striker means in said released position and during movement to said cocked position; and wherein said actuating means includes camming means mounted in said casing means and engaging said coupling part in said cocking position of said trigger means for moving said coupling part out of engagement with said striker means so that the latter moves to said released position and strikes said piezoelectric means.

5. Manual gas igniter as claimed in claim 4 wherein said striker means include a spring-biased striker hammer movable between said cocked retracted position and said released position for striking said piezoelectric means; wherein said striker hammer has a lateral coupling projection; comprising a housing mounted in said casing means enveloping said piezoelectric means and said striker means and having a slot

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through which said lateral coupling projection projects into the path of movement of said coupling part of said trigger means; and wherein said housing has a portion constituting said camming means and located in said path of movement of said coupling part.

6. Manual gas igniter as claimed in claim 4 wherein said casing parts are symmetrical casing halves and are substantially pistol shaped; wherein said housing is mounted in one of said casing halves; wherein said trigger means is mounted on the other casing half; and wherein said path of movement of said coupling part of said trigger means is parallel to the path of movement of said striker hammer between said released and said cocked retracted position; and wherein said camming portion of said housing displaces said coupling part of said trigger means in said cocking position transverse to said paths for releasing said coupling projection of said striker hammer.

7. Manual gas igniter as claimed in claim 6 wherein said trigger means is integral and said coupling part is a resilient arm integrally connected with said finger-engaging portion, said arm having a free hook end portion cooperating with said lateral coupling projection of said striker hammer.

8. Manual gas igniter as claimed in claim 1 wherein said casing parts are substantially pistol-shaped hollow symmetrical halves; wherein said piezoelectric means and said striker means are mounted in one of said casing halves; and

wherein the other casing half has guide means slidably supporting said trigger means for movement between said positions of the same along a path parallel to the direction of movement of said striker means between said released and cocked retracted positions.

9. Manual gas igniter as claimed in claim 1 wherein said casing halves are substantially pistol-shaped symmetrical halves having rims abutting each other, comprising a barrel clamped at one end between said casing halves and having insulating means at the other free end thereof for supporting said igniting electrode; a conductor passing through said barrel and connecting said electrode with said piezoelectric means; and wherein said casing halves form an opening through which said trigger means partly project out of said casing means.

10. Manual gas igniter as claimed in claim 9 comprising a housing enveloping said piezoelectric means and said striker means; wherein said piezoelectric means include an anvil supported on said housing and a piezoelectric element mounted on said anvil between the same and said striker means; wherein said striker means include a coupling projection projecting from said housing and cooperating with said trigger means; and wherein said conductor connects said piezoelectric element with said igniting electrode.

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