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(54) Lighters.

(57) An improved ignition system comprising a flint (7), a flint pressure spring (8), a flint striking gear (9a),(9b) and a trigger mechanism including a trigger spring (3) in which the trigger spring (3) and supporting parts hold and release a repulsive force, and a power transference section (6) transfers the force to the flint striking gear (9a), (9b) and resets the gear spring.

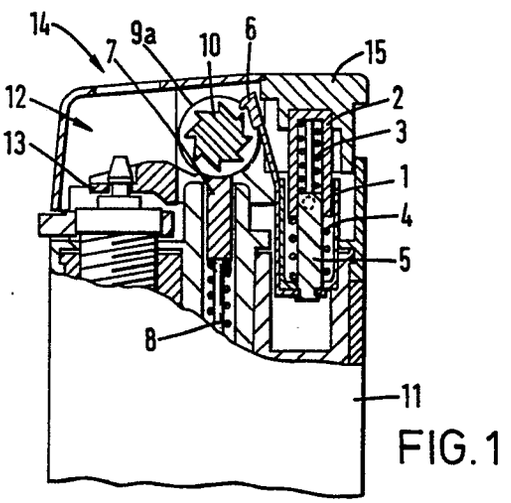

FIG.1

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LIGHTERS.

The present invention relates to an improved ignition system incorporating a flint pressure spring and a flint striking gear, the ignition system being particularly, but not necessarily, for use with a lighter.

A known ignition system to ignite a flint consists of a flint pressure spring, a flint striking gear and a trigger mechanism. The trigger mechanism uses the force of the spring being compressed and instantly released. The friction between the flint striking gear and the flint, sustained in contact therewith by the pressure spring, creates a spark to bring about ignition of a fuel.

The trigger mechanism has two casings defining outer and inner compartments; a trigger spring from the flint striking gear; a trigger reset spring which brings the mechanism back to the first stage, a cam pin which holds one end of the trigger spring and at the same time holds and releases reset force. (It rests on the inner and outer compartments.) Lastly, a jointing section which passes repulsive force from the cam pin to the flint striking gear.

The particular characteristics of the ignition system concerns the way in which the cam pin, resting on both inner and outer casings, transfers the repulsive force through to a power transference section.

Also, the flint striking gear is plate or bar shaped, and it creates a spark from the flint and resets instantly by thrusting forward and recoiling.

The flint striking gear is tubular. Part of it is connected to the wheel which the trigger mechanism rotates and causes ignition.

The replusive force caused by the trigger spring is opposite to the position of the flint striking gear. It moves through the power transference section to the flint striking gear.

The replusive force caused by the trigger spring is in the same direction to the position of the flint striking gear. It moves through the power transference section to the flint striking gear.

Heretofore, the types of ignition systems used, for example in a gas lighter and a gas cooker, have been mainly three in number, namely crystal, electric or flint.

i) Crystal works by an electronic pulse created at an end of a gas nozzle.

ii) Electric works with a battery with electricity being stored in a condenser and released.

iii) Flint words in several different ways, such as:

(a) With direct rotation of a wheel by a user.

(b) With a wheel placed against a flint striking gear with a pinion, the wheel and pinion being connected by a ratchet mechanism.

(c) With a button connected to a retainer ledge which is against the flint striking gear and the wheel by a rachet mechanism and the flint striking gear being rotated by pressing the button as in b).

A petrol lighter uses petroleum spirit and a flint ignition.

Since the ignition system of crystal and battery is a simple mechanism, people prefer it's design and function. However, it has a disadvantage, namely in the timing of gas emission and locating the pulse in exactly the right spot at the right time. Therefore, there are a lot of rejects in a production process, i.e. high wastage.

Also, material costs are high. Compared to the flint system, the electronic systems use relatively expensive parts such as crystals, battery, condenser and transformer etc. With regard to the low cost gas lighter, most of the cost is in an ignition system and assembly.

Flint ignition systems also have disadvantages. The user has to rotate a wheel with his/her finger causing occasional pain and mess on the finger from flint dust.

Also, with low cost lighters, the wheel is external and children may use them, causing burns or fire hazzards.

To overcome the above disadvantages in the flint system, some improvements have been made, namely:

i) Combination of rack, pinion, trigger wheel and rachet,

ii) trigger wheel connected to the flint striking gear is directly moved by a rachet.

Both are used with trigger buttons. The button speed co-ordinates with the wheel, and if the wheel speed is slow, it does not ignite. So the user must get the correct pressure.

Ignition energy with the flint system is greater than it would be with other systems. However, even with the improvements in the flint system, it is hard to get ignition co-ordinated.

Every time the button is pressed, the wheel speed will be different. Sometimes, the rotation angle of the striking wheel is too small. Also, the trigger wheel does not always connect properly with the power transference section. Therefore, the flame may not be constant.

The petrol lighter uses a non-conducting cloth wick and it requires a large ignition energy input. It cannot, therefore, use an easily designed crystal or electrical system.

An object of the present invention is to obviate or mitigate the above-mentioned disadvantages.

Accordingly, the present invention is an improved ignition system comprising a flint, a flint pressure spring, a flint striking gear and a trigger mechanism including a trigger spring characterised in that

i) the trigger spring, supporting parts hold and release a repulsive force; and

ii) a power transference section transfers the force to the flint striking gear and resets the gear spring.

Preferably, the flint pressure spring urges the the flint into contact with the flint striking gear, the trigger spring causes the trigger gear to increase the repulsive force by recoil, and the force is released instantly in a fixed trigger position travelling through the power transference section to acheive ignition.

Preferably also, each component returns to its original position due the influence of the reset spring.

Embodiments of the present invention will now be described in connection with a lighter and by way of example with reference to the accompanying drawings, in which:-

Figs. 1 and 2 both show side elevations of a gas lighter with an upper portion thereof in part section to illustrate an ignition system according to a first embodiment of the present invention with Fig. 1 showing a pre-ignition position and Fig. 2 showing a post-ignition position;

Fig. 3 shows a perspective view of a trigger mechanism of an ignition system according to a second embodiment;

Fig. 4 shows a perspective view of a trigger mechanism of an ignition system according to a third embodiment;

Fig. 5 shows a side elevation of a lighter whose upper portion is in part section to illustrate an ingition system according to a fourth embodiment of the present invention;

Fig. 6 shows a perspective view to a larger scale of the trigger mechanism shown in Fig. 5 with part of a wall cut-away for clarity; and

Fig. 7 shows a perspective view to the same scale as Fig. 6 of a trigger mechanism for an ignition system according to a fifth embodiment.

First of all, the ignition system shown in Figs. 1 and 2 comprises an outer casing (1) and an inner casing (2), both of which are made of plastics material. Both casings (1), (2) are tubular with one end closed, the inner casing (2) being inverted and slidable into and out of the outer casing(1). The ignition system contains a trigger spring (3), a reset spring (4) and a cam pin (5) which has a radial projection near to its upper end. A power transference element (6) is external to the outer casing (1).

The trigger spring (3) is made of coil construction with one end abutting against and internally of the closed end of the inner casing (2) and the other end abutting against the head of cam pin (5). By compression of the trigger spring (3), a repulsive force is increased by recoil.

Reset spring (4) is also made of coil construction. One end abuts against the closed end of the outer casing (1) and the other end abuts against the end of the wall of the inner casing (2). By compression of the spring (4), repulsive force is increased by recoil.

An upper part of the cam pin (5) is engaged in the open end of the inner casing (2) and is held in place by its radial projection engaging a retaining ledge in the outer casing (1). The bottom part of the cam pin (5) is engaged through the closed end of the outer casing (1) and holds the power transference element (6) as shown.

This power transference element (6) is made from metal plate by cold pressing and the bottom of this element (6) is supported by the above-mentioned cam pin (5) as shown. The upper end of the element (6) is shaped like a hook (as shown) so that it can hook into a tooth of a trigger wheel (10).

The lighter also has a tank (11) for which containing liquidified gas fuel with a valve and nozzle mechanism (12) in communication therewith and through which gas fuel is released for ignition. A flint (7) is located in a passage with a flint pressure spring (8) to urge it against the periphery of a flint striking gear wheel (9a). The trigger wheel (10) is rotationally fast with the flint striking gear wheel (9a). A push button (15) is provided located over the closed end of the inner casing (2).

In use, when a user pushes button (15) downwardly, cam pin (5), with its radial projection engaging the retaining ledge, compresses trigger spring (3) and increases its repulsive force.

Then in a certain mechanical position, a mechanical component in inner casing (2) is released from retaining ledge in the outer casing (1) by cam pin (5) movement.

The cam pin (5) which retains the trigger spring (3) in a biased position moves with the power transference element (6) instantly rotating trigger wheel (10) and flint striking wheel (9a).

Due to the repulsive force of the flint pressure spring (8) on the bottom of the flint (7) when the striking gear wheel (9a) rotates against the flint (7), it delivers a spark.

The bottom of push button (15) moves the edge of a valve lever (13) and this opens valve and nozzle mechanism (12) and releases gas (made of liquified petroleum) through the nozzle causing a flame at the flame opening (14) ignited by the above-mentioned spark.

The reset action operates as follows: When pressure to push button (15) is released, the reset spring (4), which has been compressed, lifts inner

casing (2) and returns it to its original position. At the same time, valve mechanism (12) is closed to extinguish flame of the ignited fuel.

In a second embodiment as shown in Fig. 3, the trigger mechanism is similar to the trigger mechanism of the first embodiment and like numerals are used to denote like parts. The trigger mechanism comprises a trigger spring (3), a reset spring (4) and a cam pin (5) in both outer casing (1) and inner casing (2).

The trigger mechanism in Fig. 3 also consists of a power transference element (6) located inside the outer casing (1) and penetrates into the inner casing (2). The radial projection of the cam pin (5), resting on the retainer ledge projects from the outer casing (2) through an opening (6a). With the above-mentioned structure, the biasing of the trigger spring (3) transfers to the power transference element (6).

On the other hand, trigger mechanism of the third embodiment as shown in Fig. 4 in which like numerals are used to denote like parts, part of the power transference element (6) is attached around the outer casing (1) and the radial projection on cam pin (5) engages in retainer ledge, which moves by touching opening (6a) in the power transference element (6).

Figs. 5 and 6 illustrate a fourth embodiment in which like parts are denoted by like numerals. In this embodiment, the force of trigger spring (3) travels in the same direction as the flint striking wheel (9a). The trigger wheel (10) is thrust forward and rotates at location of the power transference element. The trigger mechanism in Fig. 5 comprises a power transference element (6) which is attached around outer casing (1). The cam pin (5) is retained and functioned at its opening. The inner structure is similar to the embodiments as before.

As to the trigger mechanism in Fig. 6, the power transference element (6) is placed inside the outer casing (1) just like the embodiment in Fig. 3. The difference is that the power transference element is horizontally oriented to extend out in a different direction moving trigger wheel (10).

The embodiment as shown in Fig. 7 again is similar to the other embodiments but with the flint striking gear (9b) being of plate shape . The structure and movement of this trigger mechanism is like that in Fig. 6. Either the power transference element and the flint striking are one part, or are seperate but attached and only the plate moves backward and foward.

In this case, the flint connects with striking plate (9b) at right angles and the movement of the plate (9b) causes sparks with the flint.

In this example, both trigger and reset springs are made in coil formation. However depending on the structure of trigger mechanism, a plate or torsion spring can be used. Materials and method are not limited.

The ignition system as above-described uses a flint, but by using the force of springs it manages to acheive a constant reliable pressure for ignition. Because the problem of timing, pressure and accurate spark delivering are overcome, productivity is greater (there are fewer rejects) and selling price becomes lower.

A gas lighter with liquified petrolium gas has been used as an example but this system can be used with a oil lighter with petroleum spirit or a gas cooker/burner, i.e. this system is not limited to lighters.

This ignition system is based on a flint system, however method of use is like that for crystal or battery system, due to the fact that this system works by recoil force. It, therefore, achieves constant reliable ignition.

The ignition energy of this flint system is greater than that of either crystal or battery, and is reliable in terms of timing and locations of ignition spark. Therefore reject numbers in production are lower which enables mass production cheaply compared with other two systems.

Also, ignition energy is so great that it can be used for oil lighter and button pressure is like that of crystal or battery. As another merit, the outer casing design is flexible.

For example, by adapting this invention to low cost gas lighters, pain in and mess on finger caused by external wheel are avoided. Fire hazzard caused by lighters getting into hands of infants/children is greatly reduced.

These are the benefits of the invention.

Claims

1. An improved ignition system comprising a flint, a flint pressure spring, a flint striking gear and a trigger mechanism including a trigger spring characterised in that

i) the trigger spring (3), supporting parts hold and release a repulsive force; and

ii) a power transference section (6) transfers the force to the flint striking gear (9a), (9b) and resets the gear spring.

2. Ignition system as claimed in Claim 1, characterised in that the flint pressure spring (8) urges the flint (7) into contact with the flint striking gear (9a),(9b), the trigger spring (3) causes the trigger gear to increase the repulsive force by recoil, and the force is released instantly in a fixed trigger position travelling through the power transference element (6) to acheive ignition.

3. Ignition system as claimed in Claim 1 or 2, characterised in that each component returns to its

original position due the influence of the reset spring (4).

4. Ignition system as claimed in Claim 1, 2 or 3, characterised in that a button (15) in mounted over an inner casing (2) and on depression causes movement of a valve lever (13) to open a valve and nozzle mechanism (12) to release fuel from a tank (11) in communication therewith.

5. Ignition system as claimed in Claim 4, wherein when button (15) is released, the reset spring (4) lifts the inner casing (2) due to its biasing to return it to its original position and releasing valve lever (13) to close the valve and nozzle mechanism (12).

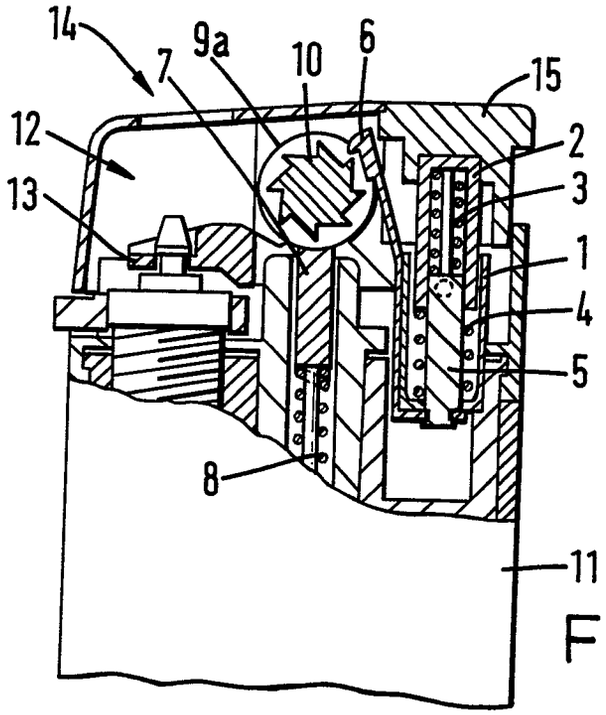

FIG. 1

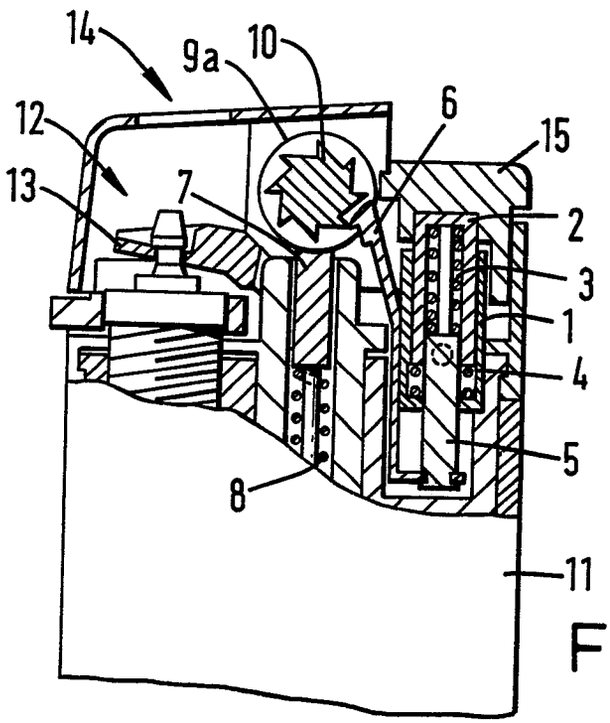

FIG. 2

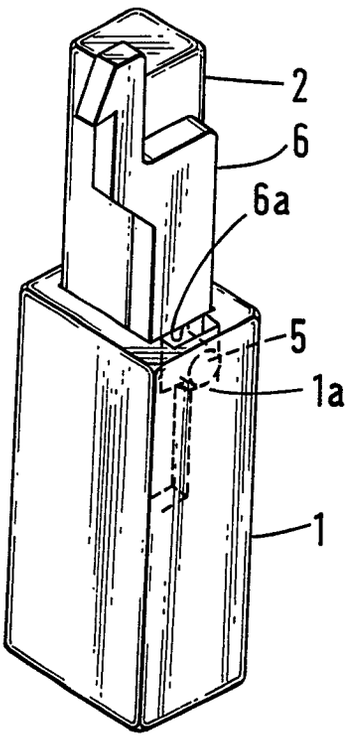

FIG. 3

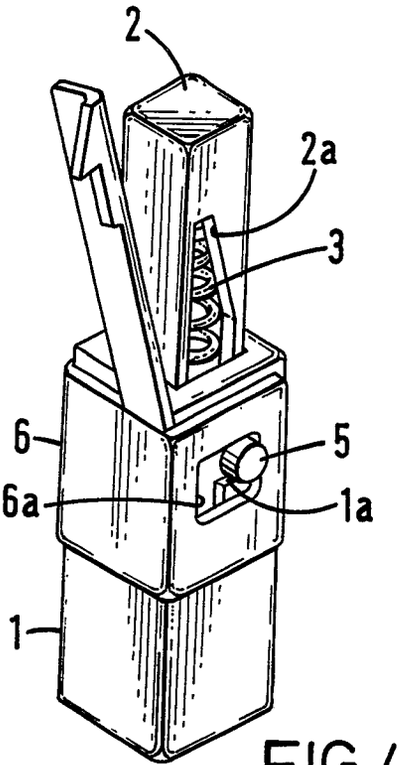

FIG.4

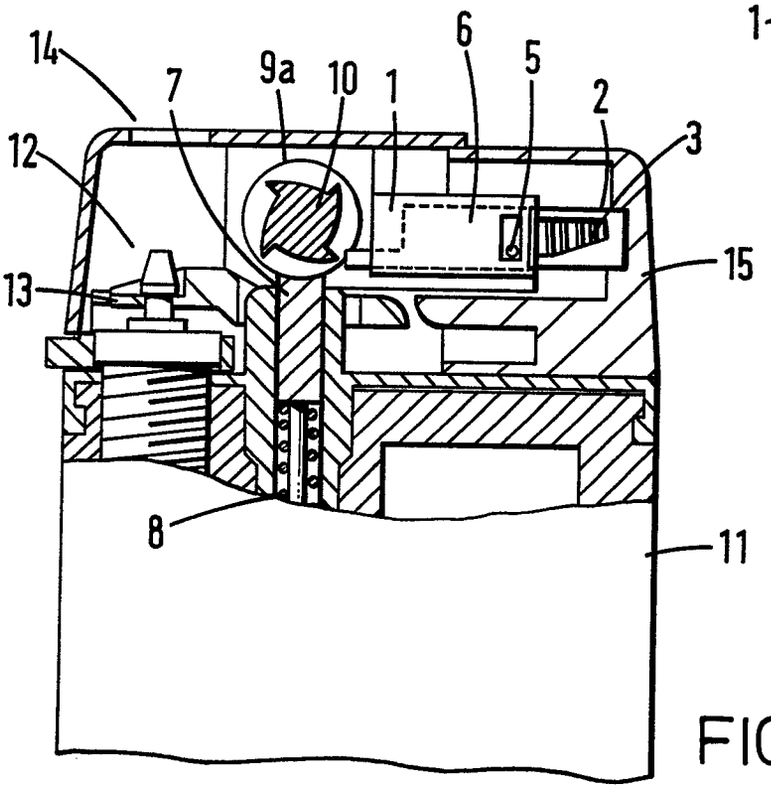

FIG.5

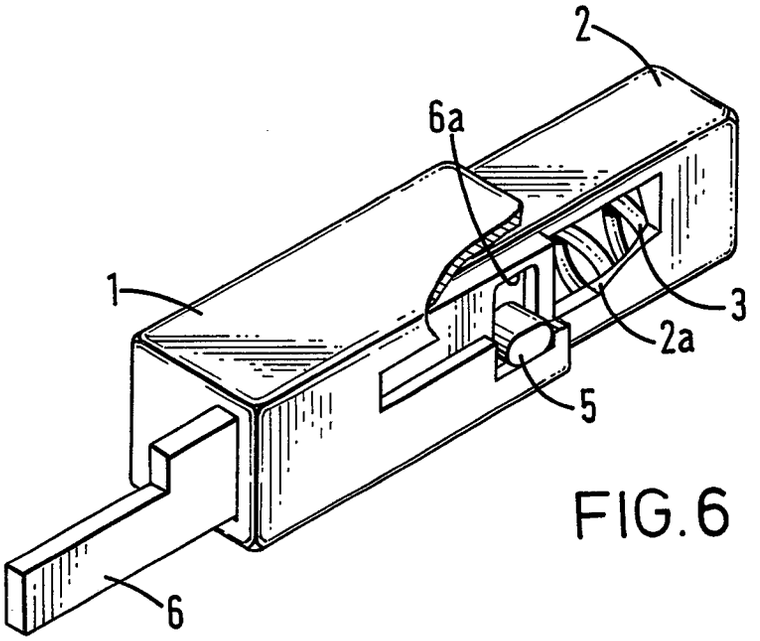

FIG.6

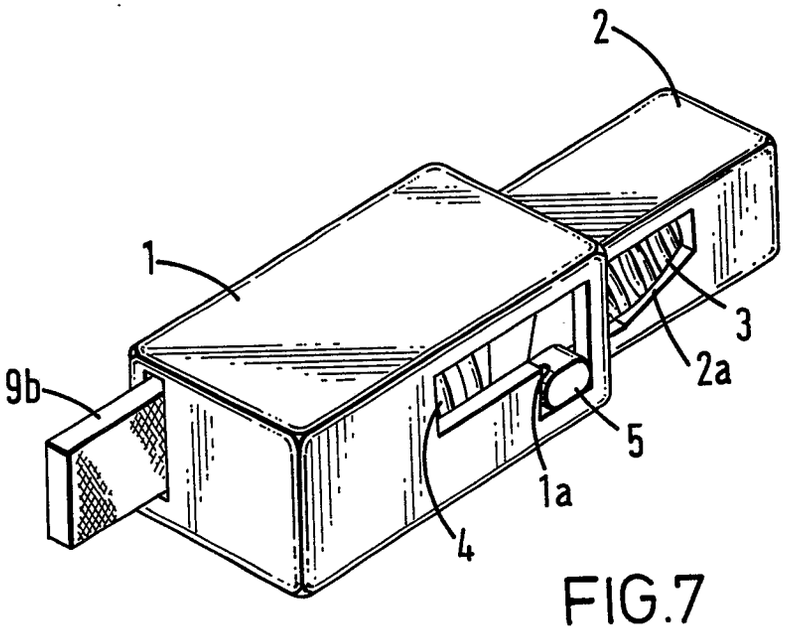

FIG.7