United States Patent

Du Pont

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[54] **SPARK WHEEL ACTUATING MECHANISM PARTICULARLY FOR CIGARETTE LIGHTERS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **431/275**

[51] **Int. Cl.** **F23q 2/06**

[58] **Field of Search** 431/137, 275

[56] **References Cited**

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[57] **ABSTRACT**

In a spark wheel actuating mechanism of the type that accumulates and suddenly releases energy, in order to render the operation independent of the skill of the user, the said mechanism includes an arming disc turnable by the user; said arming disc compresses a driving spring which exerts a force on a pivotable lever immobilized by a detent and operatively connected to the spark wheel; at the end of its possible angular displacement, the said arming disc causes displacement of said detent. As a result, the said arm is rapidly swung by said spring and thus, a brief, high-speed rotation is imparted to the spark wheel.

4 Claims, 3 Drawing Figures

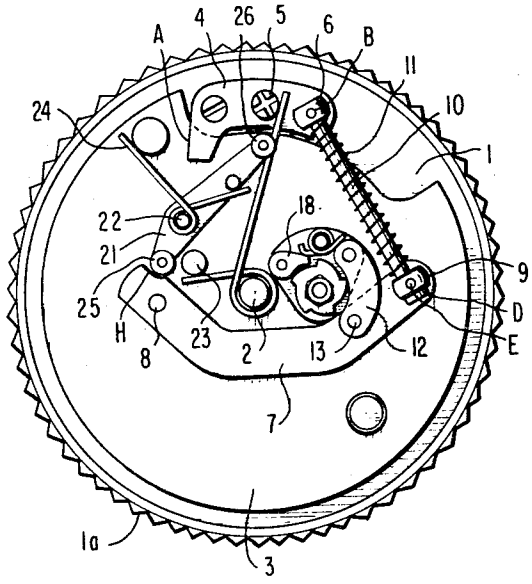


FIG. 1

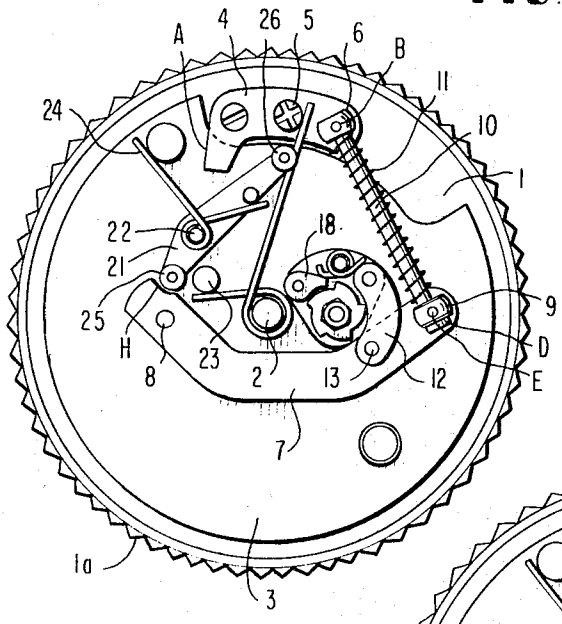
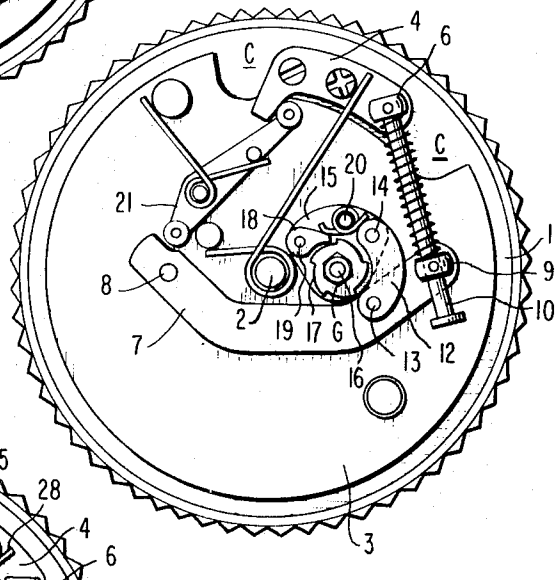


FIG. 2



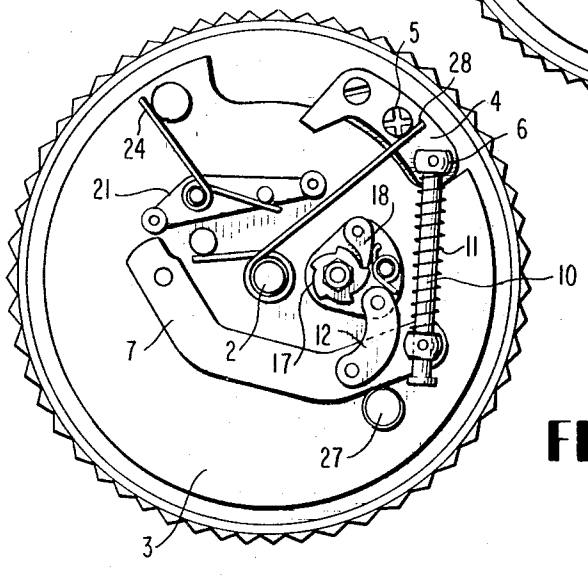


FIG. 3

SPARK WHEEL ACTUATING MECHANISM PARTICULARLY FOR CIGARETTE LIGHTERS

BACKGROUND OF THE INVENTION

This invention relates to spark wheel actuating mechanisms which, under the effect of a continued force exerted by the user, accumulate potential energy which is suddenly released rotating the spark wheel with great acceleration and speed.

The spontaneous ignition of particles torn from a flint by the frictional engagement with a spark wheel, depends in a large measure on the heat generated by such friction. To ensure ignition, it is thus advantageous to increase the heat. Such heat increase, in turn, may be achieved by increasing the rotational speed of the spark wheel.

In most all known spark wheel actuating mechanisms the rotational speed of the spark wheel depends entirely, or at least in part, on the skill of the user, whether he acts directly upon the spark wheel driving means or whether he causes the spark wheel to rotate by an intermediate linkage system. In all known devices of the latter type, which are often improperly designated as "automatic" or "semi-automatic," a point of maximum resistance has to be overcome by the arming means. For this purpose, the user has to increase the force exerted by his finger on the arming means, and thus accumulating in his finger a certain potential energy which is suddenly released as soon as said resistance is overcome and thus the necessary rotational speed is imparted on the spark wheel.

In order to render the functioning of the spark wheel actuating mechanism independent of the skill of the user, several systems have already been proposed in which the spark generating mechanism, which is formed of a lever and pivoting link assembly, is actuated by elastic means during the displacement of an arming means. The said spark generating mechanism is retained in an inactive position and the elastic means accumulates potential energy during a first part of the displacement of the arming means. During the terminal motion of the latter, the spark generating mechanism is released and is driven by the suddenly released elastic means.

Known devices of the aforenoted type all have the disadvantage that they are relatively cumbersome and therefore they find application only on cigarette lighters provided with a pivoting closure. The height of such closure permits to accommodate a part of the mechanism and permits the use of the lever and pivoting link assembly. Further, the displacement of the arming means in all known structures encounters a point of maximum resistance at the moment when the mechanism is released. To overcome this point, a particular effort on behalf of the user is required. Such increased effort, however, is compatible only with a longitudinally shifting arming means or with one which comprises a sufficiently long pivoting lever.

It is apparent that the aforenoted disadvantages do not permit to adopt such a device in a cylindrical cigarette lighter without substantially increasing its height or without providing it with components which protrude laterally, at least during the process of ignition.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved spark wheel actuating mechanism of the type that accumulates and suddenly releases energy during a cycle of operation that is independent of the user's skill.

It is another object of the invention to provide an improved spark wheel actuating mechanism of the aforenoted type that has a simple and compact structure adapted to be used on cylindrical cigarette lighters without the necessity of enlarging the latter.

Briefly stated, according to the invention, there is provided an arming disc rotatable by the user to compress a spring exerting a force to a pivotable arm which is held in a locked position by a detent until said arming disc reaches the end of its possible displacement. By that time the maximum potential energy is accumulated in said spring. At the end of its possible displacement, the arming disc releases said detent and as a result, the said spring causes a sudden, rapid pivotal motion of said arm. By virtue of a linkage means connecting said arm with said spark wheel, the latter is caused to briefly and rapidly rotate as the arm pivots under the force of the suddenly released energy of said spring.

The invention will be better understood, as well as further objects and advantages will become more apparent, from the ensuing detailed specification of a preferred, although exemplary, embodiment of the invention taken in conjunction with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIGS. **1**, **2** and **3** are bottom plan views of the preferred embodiment of the invention in positions of rest, tensioning and releasing, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The cylindrical cigarette lighter body, not shown, with which the mechanism according to the invention is associated, includes at its upper terminus a fixed circular mounting plate **3** provided along a peripheral portion with a wide cutout or notch C. Openings in the plate **3** to accommodate the burner and the flint tube are not shown.

The means for arming the spark wheel actuating mechanism is formed of a disc **1**, the periphery **1***a* of which is knurled for firm engagement with the user's finger. Such engagement is further assisted by a disc diameter slightly larger than that of the cylindrical lighter body. The arming disc **1** is rotatably mounted on the mounting plate **3** by means of a centrally disposed bearing pin **2**.

To the arming disc **1** there is rigidly affixed a support **4** integral with a nose A oriented inwardly. The support **4** carries an abutment lug **5** and a pin B about which pivots a rod **10** by means of a collar **6** integral with said rod. The support **4**, which is disposed in the cutout C, limits the angular movement of the disc **1** to the width of the cutout. The spark wheel, which is not visible in the figures, has a shaft **16**, to which there is keyed a hexagonal member G carrying a ratchet wheel **17**. In this manner, the spark wheel and the ratchet wheel **17** are constrained to rotate in unison.

About shaft **16** of the spark wheel there is mounted for free pivotal motion a plate **15** which carries a pawl **18** pivotally secured thereto by a pin **19**. The pawl **18** is urged against the ratchet wheel **17** by a spring **20** also carried by the plate **15**.

An angularly bent lever **7** is mounted for pivotal motion in the plane of the plate **15** about a pin **8** affixed to the mounting plate **3**. The pivot pin **8** divides the lever **7** into two arms of substantially unequal lengths. At the terminus of its longer arm, the lever **7** carries a journaling thimble **9** secured thereto by means of a pivot pin E. To the long arm of lever **7** there is pivotally mounted, between pins **8** and E, an arcuate link **12** by means of a pin **13**. The other end of arcuate link **12** is pivotally jointed to plate **15**. The arm **12** is shaped in such a manner that, in its position of rest, it partially surrounds the ratchet wheel **17** to further reduce the dimensions of the device. The rod **10** slidably projects through the thimble **9** and carries at its terminus a head D which forms an abutment for the thimble **9**. A coil spring **11** surrounds the rod **10** and is slightly precompressed between the collar **6** and the thimble **9** when the latter abuts the head D.

The spark wheel actuating mechanism further comprises a detent means formed by a rocker **21** pivotally mounted on plate **3** by a pin **22**. A spring **24** urges the rocker **21** to engage an abutment lug **23** integral with plate **3**. The pivot pin **22** divides the rocker or detent **21** into two arms of unequal lengths. When the rocker **21**, in its position of rest, is in engagement with the abutment lug **23**, a roller **25** carried at the terminus of the shorter arm of rocker **21** is nested in a depression H provided in the shorter arm of lever **7**. At the terminus of its long arm, the rocker **21** carries a roller **26** which, in the position of rest, lies substantially tangentially with respect to the base of the cutout C.

OPERATION OF THE PREFERRED EMBODIMENT

In the position of rest (FIG. 1), the rocker **21** is in contact with the abutment **23**; the roller **25** is in engagement with the depression H. The slightly precompressed driving spring **11** exerts a weak clockwise torque through thimble **9** on lever **7** about pin **8**. In this position of rocker **21**, the lever **7** is maintained immobilized by the roller **25**. The pawl **18** is urged by the spring **20** into one of the teeth of the ratchet **17**. As well seen in FIGS. **1** and **2**, in this immobilized position of the lever **7**, the ratchet-engaging portion of the pawl **18** is at a distance from that tooth of the ratchet wheel **17** which is next to cooperate with the pawl **18**.

For generating a spark, the user engages, usually with his thumb, the knurled portion **1***a* of the arming disc **1** and starts rotating it about pivot **2** (FIG. 2). During such rotation, the support **4** travels in cutout C. Since the lever **7** is still held locked by the roller **25** of the rocker **21**, the rod **10** slides in the thimble **9** and, as a result, the driving spring **11** is compressed between the thimble **9** and the collar **6**. Upon travelling a predetermined course, the nose A enters into abutting engagement with the roller **26** and, upon continued motion of the arming disc **1**, the rocker **21** is moved clockwise against the force of its return spring **24**. Thus, the rocker **21** moves away from the abutment **23** and the roller **25** rolls in the depression H towards the end of the lever **7**, still maintaining the latter in its initial, locked position. The compression of the driving spring **11** continues.

As the support **4** nears the end of the cutout C (FIG. 3), and before the roller **26** escapes the nose A, the roller **25** glides off the depression H. At that moment, since the lever **7** is no longer restrained, the driving spring **11** suddenly expands, moving the lever rapidly clockwise about pin **8**. Consequently, the lever pulls the link **12** which, in turn, causes a fast rotation of the plate **15** and an orbital motion of pawl **18**. The latter, after a short travel, enters into engagement with a tooth of ratchet wheel **17** and thus, from this moment on, the plate **15** and the ratchet wheel **17** (and thus the spark wheel, not shown) rotate in unison at high speed. In the embodiment described, the rotation of the ratchet wheel **17** is equal to one-fifth of its circumference. The pivotal motion of the lever **7** and consequently the rotation of the plate **15** and of the ratchet wheel **17** are limited by an abutment lug **27** affixed to the plate **3**. In this manner, an impact of thimble **9** against the head D is prevented. It is to be noted that in this position of release, the rocker **21** is not able to return to its initial position under the action of spring **24**, since the roller **25** is in abutting engagement with the frontal edge of the short arm of lever **7**.

As the user releases the arming disc **1**, the latter is returned to its position of rest by a spring **28** which is in engagement with the abutment lug **5** affixed to support **4**. During the course of this return movement, the head D of the rod **10** draws with it counterclockwise the lever **7** by engagement with the thimble **9**; the link **12** turns the plate **15** counterclockwise, while the pawl **18** passes over a tooth of the ratchet wheel **17** (maintained in position by the pressure of the flint exerted on the spark wheel) and assumes a position behind the next tooth of the ratchet **17**. The rocker **21** is returned by the spring **24** to the abutment **23** and the roller **25** assumes its initial position in the depression H of the lever **7**.

Thus, the mechanism is re-set into its initial position of rest and is ready to perform a new cycle of operation.

What is claimed is:

1. A spark wheel actuating mechanism, comprising

A. an arming means manually rotatable to a predetermined extent,

B. a rod pivotally secured at one end to said arming means,

C. a lever pivotable about an axis spaced from the axis of said spark wheel,

D. a thimble pivotally secured to said lever remote from its pivotal axis, said rod being slidably held in said thimble,

E. a coil spring surrounding said rod between said arming means and said thimble and accumulating potential energy by being progressively compressed by said arming means upon rotation thereof, said coil spring exerting a torque on said lever through said thimble,

F. detent means maintaining said lever locked until said arming means reaches a predetermined position during the course of its limited rotary movement under the effect of a manual force applied thereto, said detent means being formed of a rocker angularly movable about a pivot, said pivot dividing said rocker into

1. a relatively short arm having an end for engaging said lever to hold the latter in a locked position and

2. a relatively long arm having an end,

G. means connecting said lever to said spark wheel to cause rotation of the latter upon pivotal motion of said lever, and

H. means for engaging the end of said relatively long arm to pivot said rocker and to move the end of said relatively short arm out of contact with said lever when said arming means reaches said predetermined position for unlocking said lever to permit a pivotal motion thereof in response to said torque.

2. A spark wheel actuating mechanism, comprising

A. an arming means manually rotatable to a predetermined extent,

B. resilient driving means connected to said arming means and accumulating potential energy upon rotation of said arming means,

C. a lever pivotable about an axis spaced from the axis of said spark wheel, said resilient means connected to and exerting a torque on said lever,

D. detent means maintaining said lever locked until said arming means reaches a predetermined position during the course of its limited rotary movement under the effect of a manual force applied thereto, said detent means being formed of a rocker angularly movable about a pivot, said pivot dividing said rocker into

1. a relatively short arm having an end for engaging said lever to hold the latter in a locked position and

2. a relatively long arm having an end,

E. means connecting said lever to said spark wheel to cause rotation of the latter upon pivotal motion of said lever and including

1. a link pivotally secured by one end to said lever at a location remote from its pivotal axis,

2. a plate mounted for pivotal movement about the axis of said spark wheel; the other end of said link is pivotally secured to said plate at a location remote from its pivotal axis,

3. means connecting said spark wheel with said plate to cause a rotation in unison therewith when said lever executes a pivotal motion in response to said torque and

F. means for engaging the end of said relatively long arm to pivot said rocker and to move the end of said relatively short arm out of contact with said lever when said arming means reaches said predetermined position for unlocking said lever to permit a pivotal motion thereof in response to said torque.

3. A spark wheel actuating mechanism as defined in claim **2**, wherein said means connecting said spark wheel with said plate is formed of

A. a ratchet wheel connected to said spark wheel and

B. a pawl pivotally secured to said plate and cooperating with a tooth of said ratchet wheel during pivotal movement of said plate in response to said torque.

4. A spark wheel actuating mechanism as defined in claim **2**, wherein said lever and said plate pivot in the same plane.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,661,498 Dated May 9, 1972

Inventor(s) André Pierre Francois Dupont

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet of the patent the inventor's last name is printed incorrectly, i.e., "Du Pont". The correct spelling should be -- Dupont --.

Signed and sealed this 19th day of September 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents