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(54) **DISPOSABLE LIGHTER WITH SAFETY IGNITION FEATURE**

(52) **U.S. Cl. 431/153; 431/277**

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(57) **ABSTRACT**

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A disposable lighter with safety ignition unit is comprised of a body and a head, wherein a nozzle, a ring, a wind mask, a lever press plate, a spring, a flint, a bracket and an igniting wheel set with safety ignition unit are arranged on said head. The igniting wheel set with safety ignition unit includes two central axles, two cinctures and an igniting wheel which is used to make friction with said flint so as to generate sparks, said two cinctures are located on each end of said igniting wheel, the inner diameter(s) of said cincture is slightly larger than the outer diameter of the portions of the igniting wheel set which they encircle, so as to form the rotation of the cinctures as "sliding wheels." The two central axles are supported on the bracket of the outer head and act as common rotational axle of said cinctures and igniting wheel. Characterized by its reasonably structured design and low cost, the present disposable lighter can effectively avoid dangers caused by ignition of lighter by a child or errors in operation.

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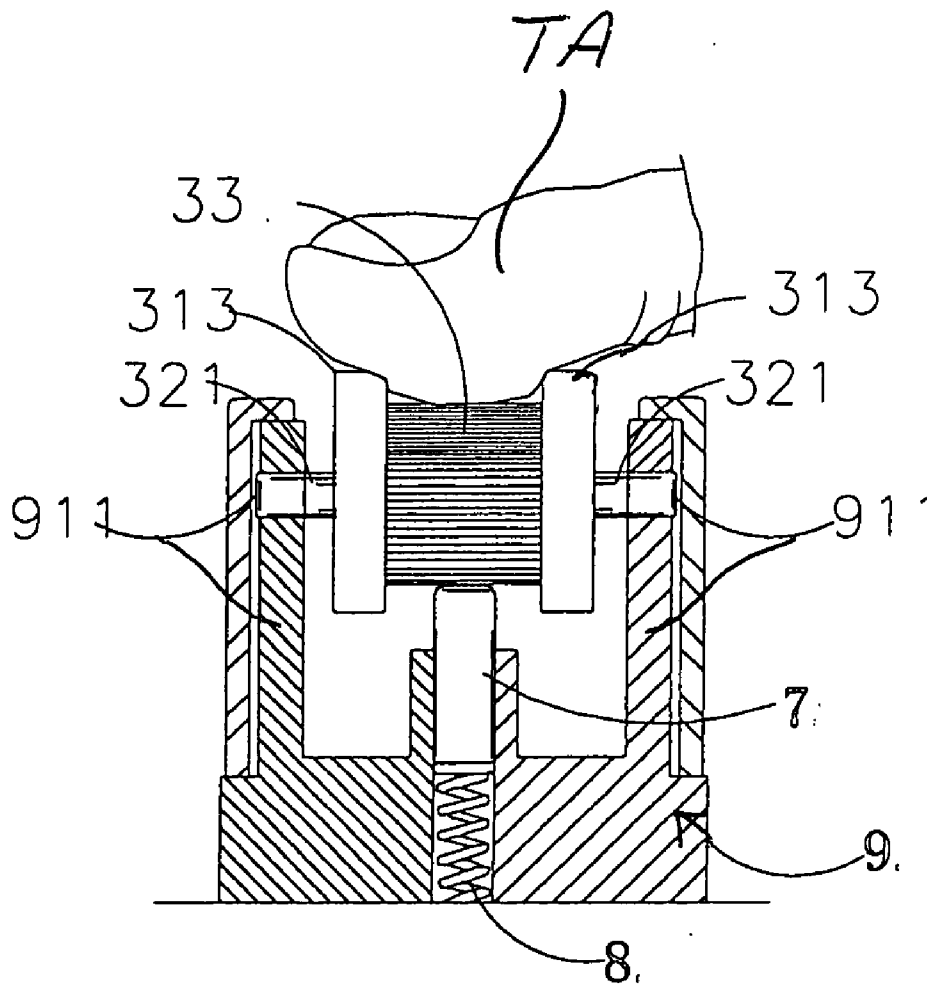
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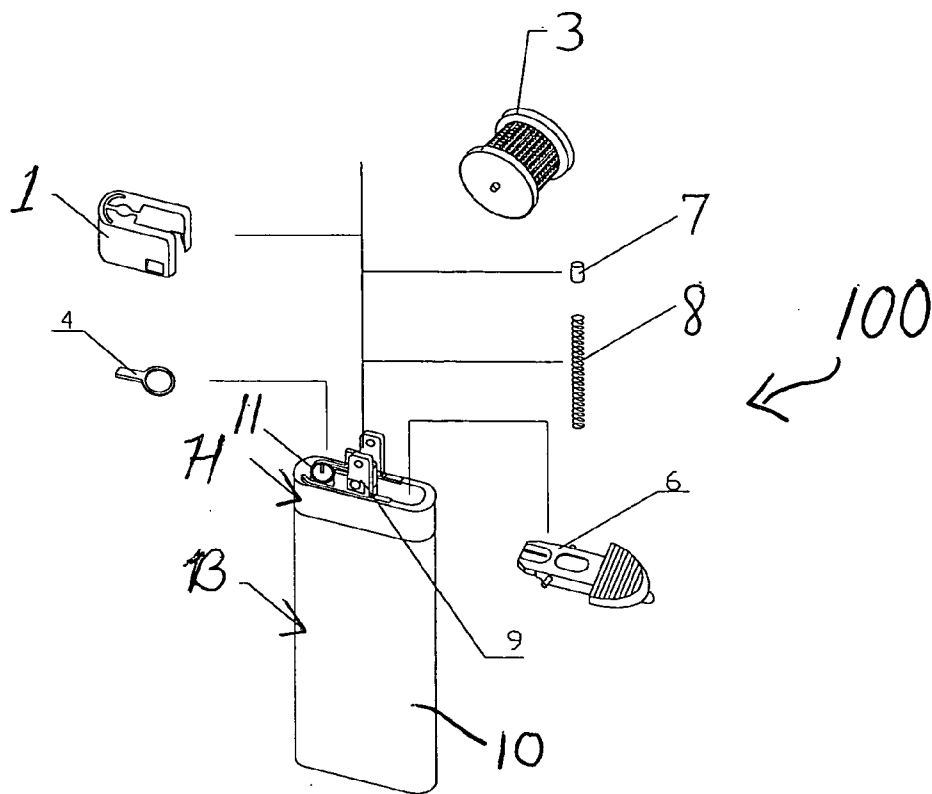


Figure 1

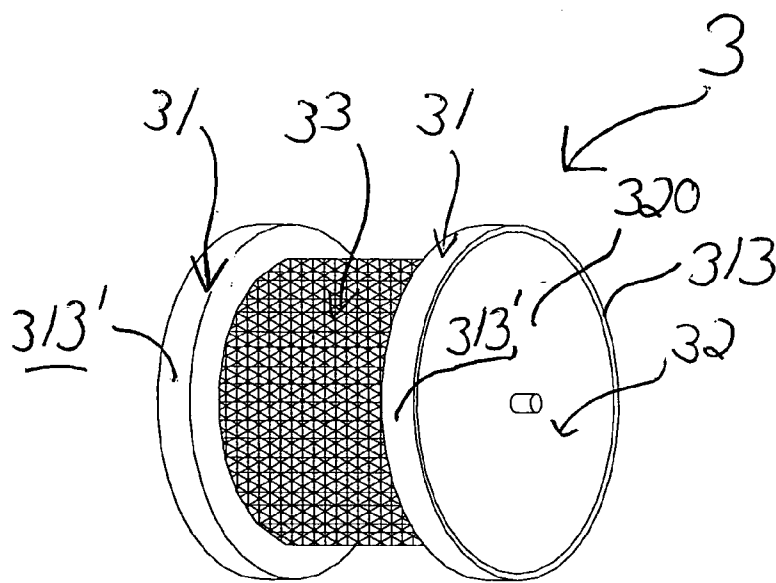


Figure 2

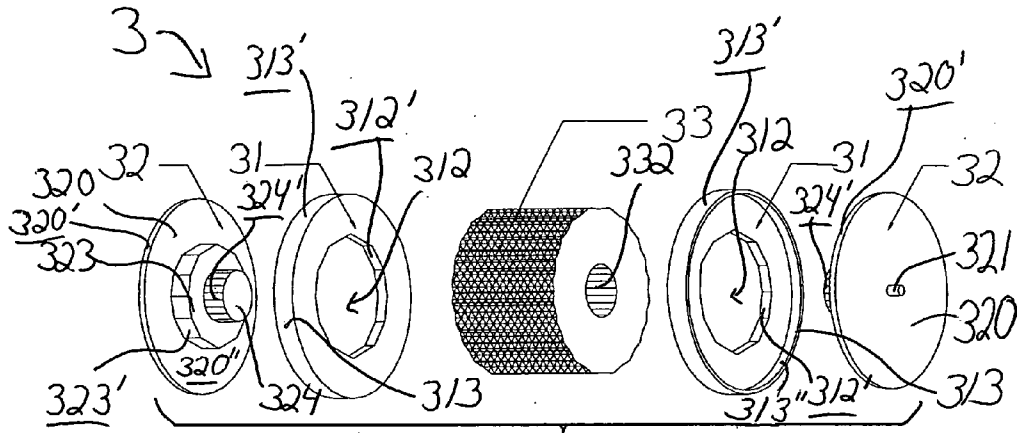


Figure 3

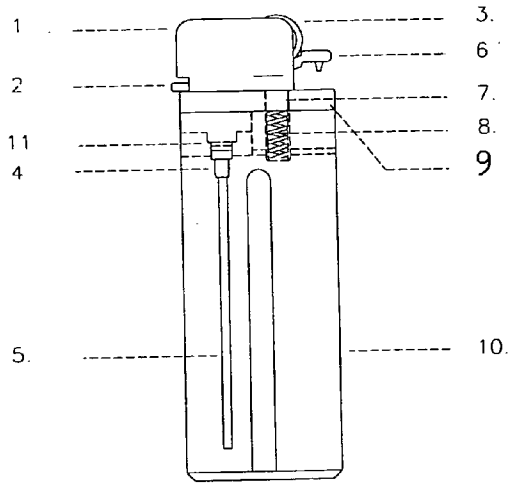


Figure 4

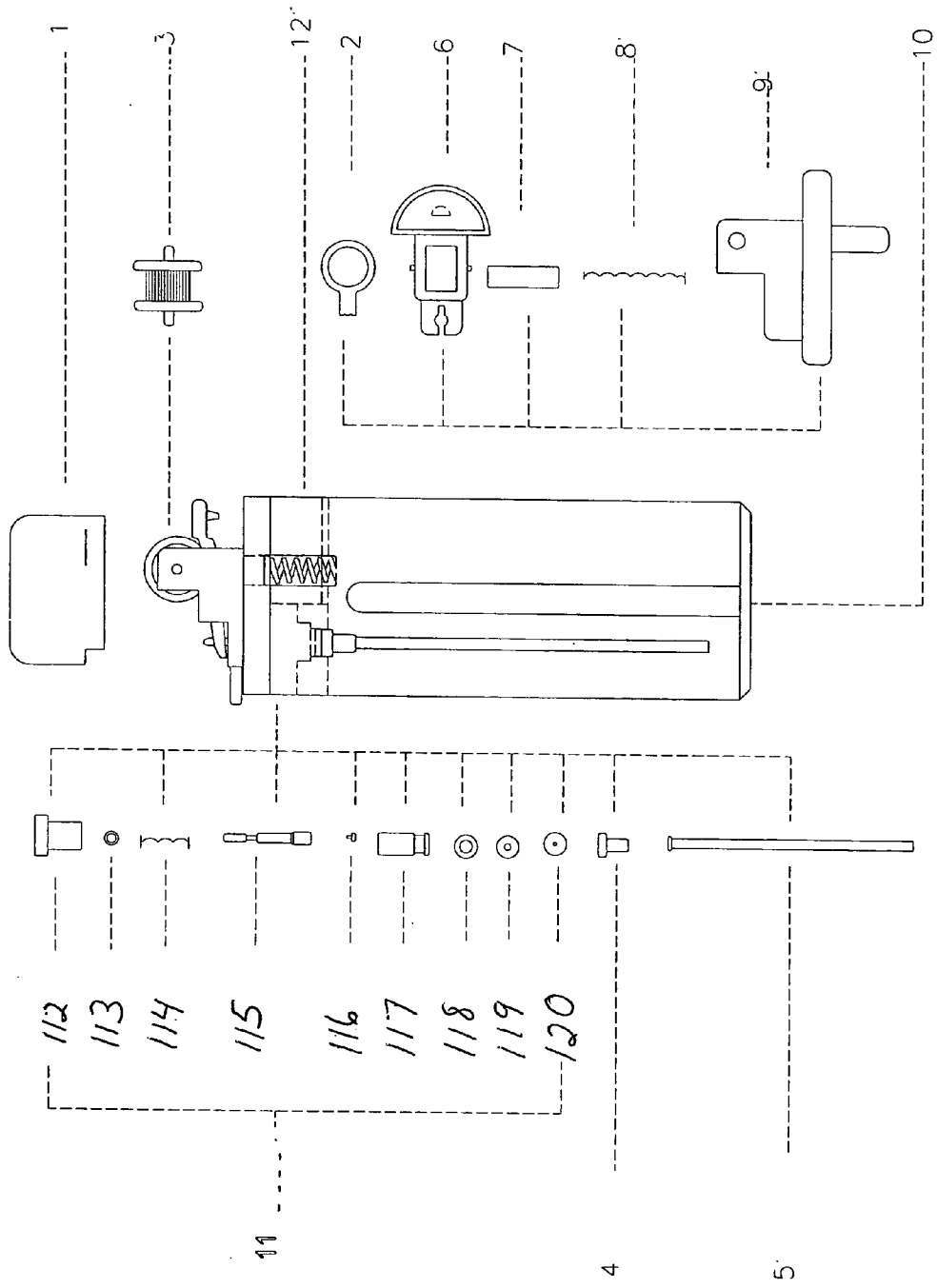


Figure 5

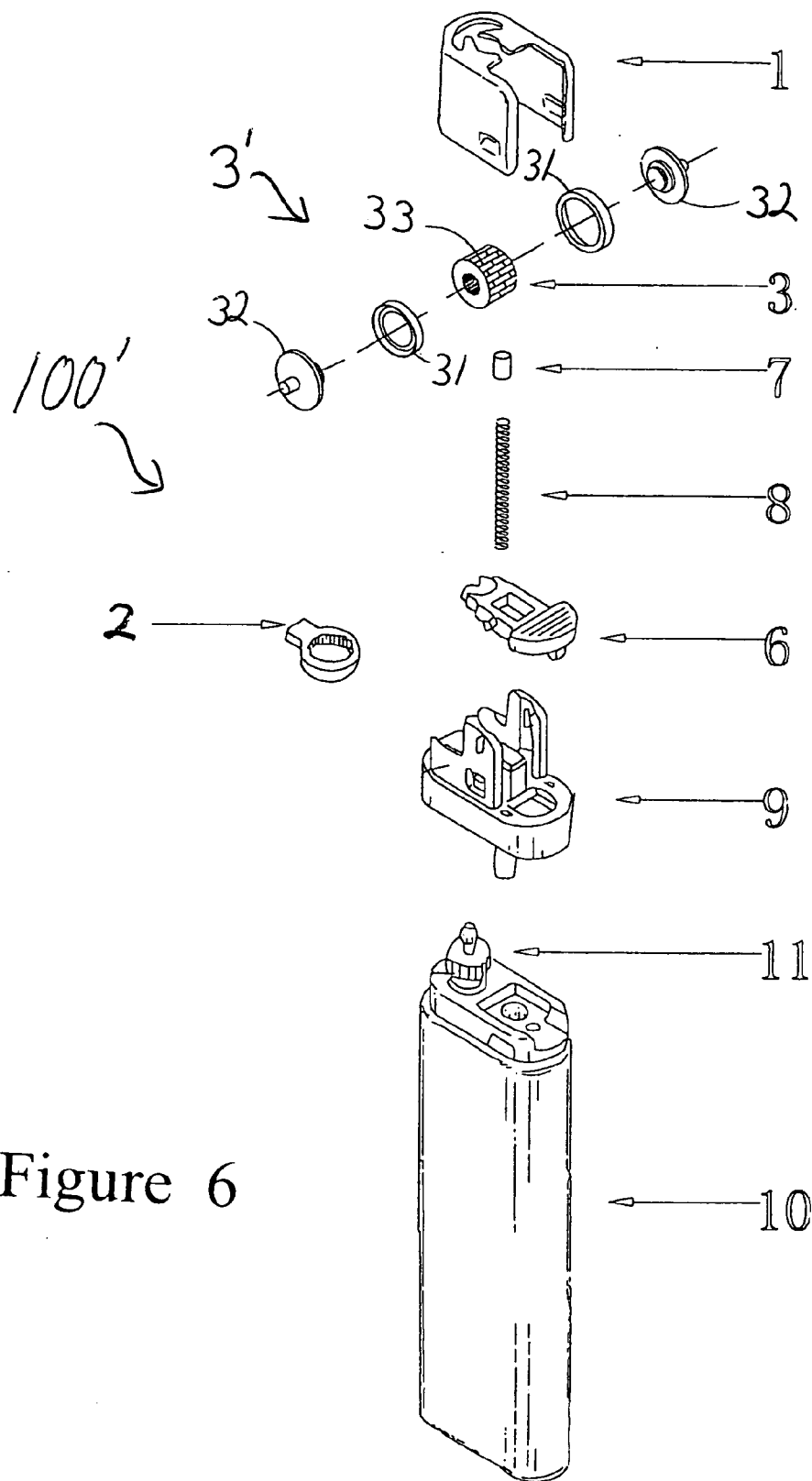


Figure 6

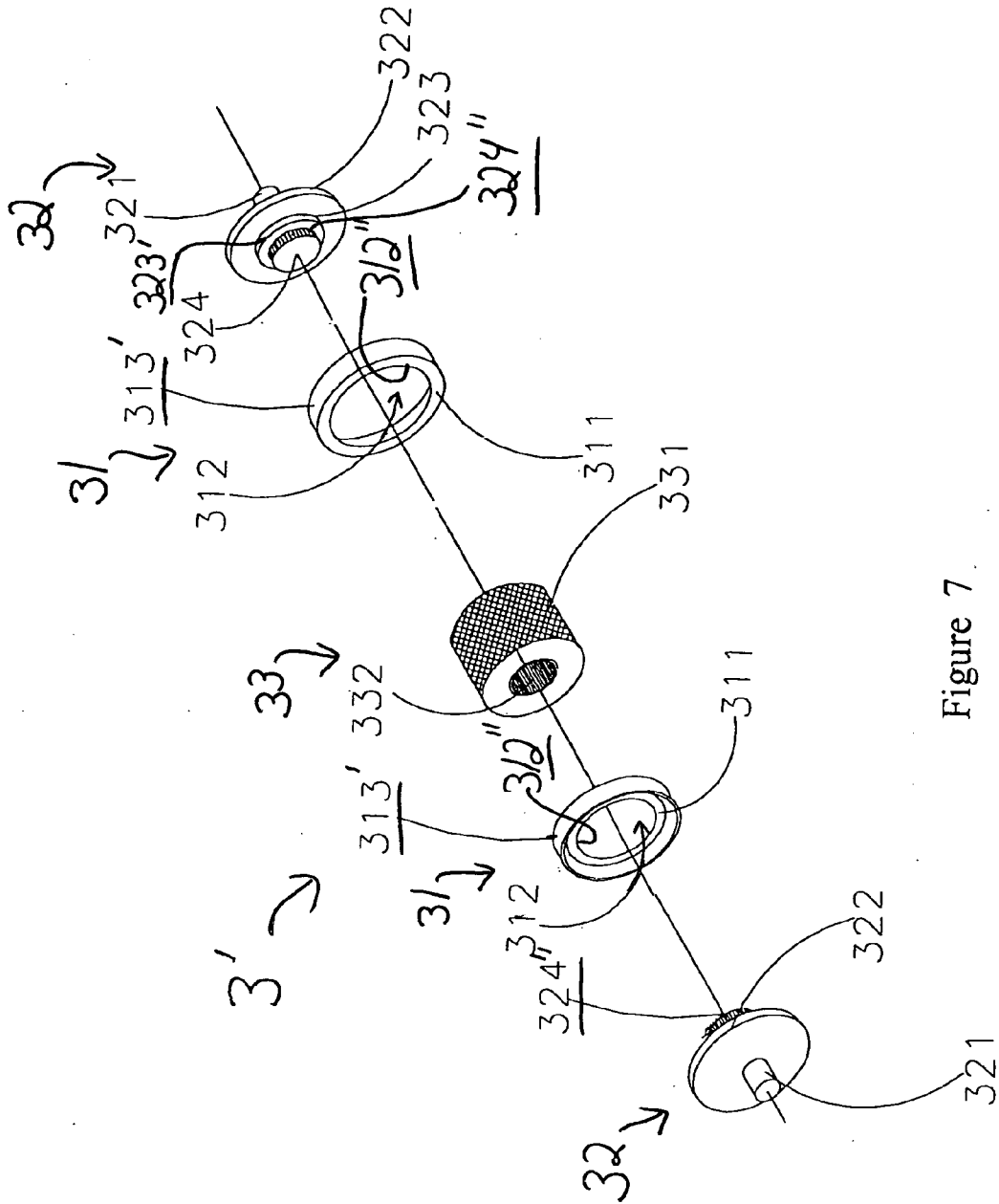


Figure 7

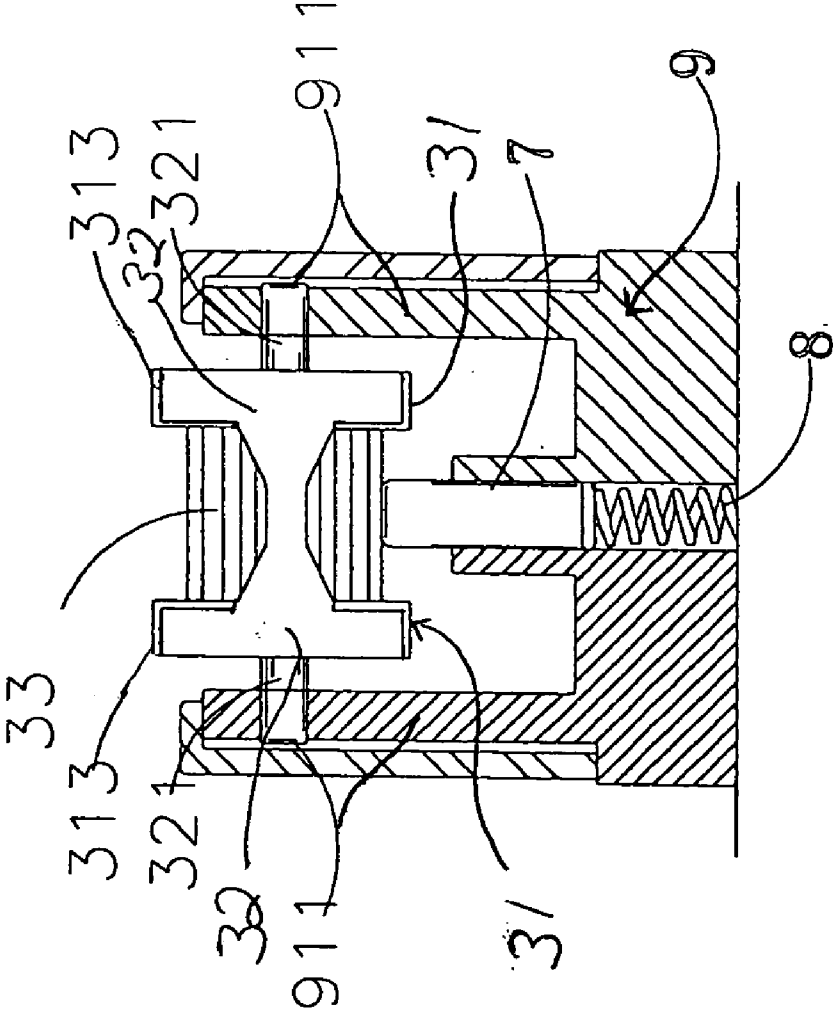


Figure 8

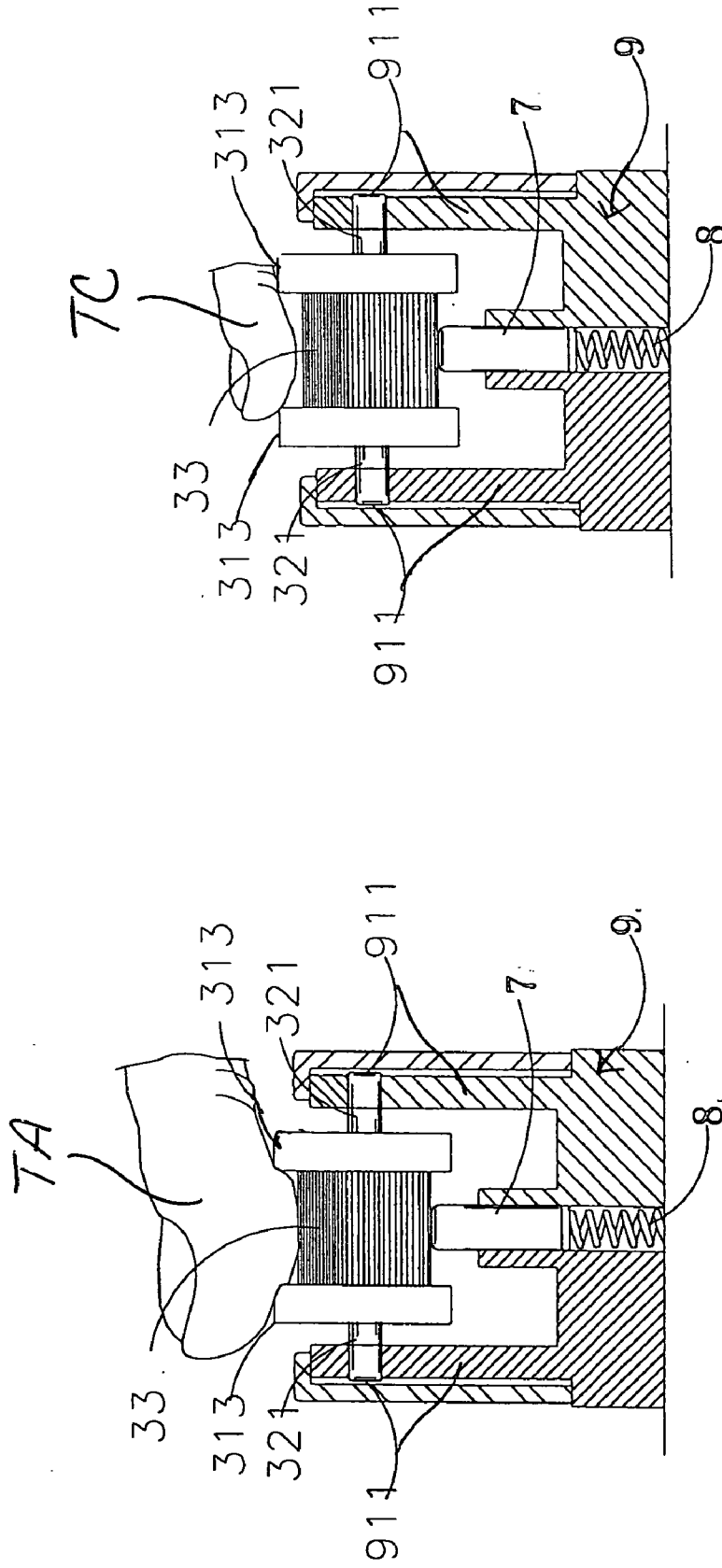


Figure 10

Figure 9

DISPOSABLE LIGHTER WITH SAFETY IGNITION FEATURE

[0001] This application claims priority of, and is a continuation-in-part of, PCT International Application, PCT/CN2006/00134, filed Jan. 24, 2006, which application is incorporated herein by this reference.

FIELD OF INVENTION

[0002] The present invention relates to a disposable lighter with a safety ignition unit that makes the operation of an unintended user more difficult, more particularly an ignition unit preventing children from igniting the disposable lighter unnecessarily.

BACKGROUND

[0003] Presently, most lighters available in the market, especially disposable lighters, can be easily ignited by young children and thus cause hidden dangers in property loss and personal injury. More and more countries, especially Western countries, have attached great importance to the protection of children and imposed strict measures on safety requirements for lighters. Nowadays, both the U.S. government and U.S. Consumer Product Safety Commission demand a safety device in every cigarette lighter, including the disposable lighter, in order to prevent accidental ignition or ignition by a child.

[0004] A "simple lighter," without a safety ignition unit, generally includes a body and a head, on which there is a nozzle, a ring, a wind mask, a lever press plate, a spring, a flint, a bracket, and an igniting wheel set mounted on the bracket, wherein the igniting wheel set is an igniting wheel and a cincture that are fixed together and rotate and stop simultaneously. The conventional cincture includes a central axle on which the igniting wheel is fixedly mounted. The conventional cincture is positioned so that its outer perimeter is slightly higher than the igniting wheel, normally as a result of the igniting wheel being mounted coaxially with the cincture, and the cincture having a larger outer diameter than the outer diameter of the igniting wheel. This conventional cincture typically has a toothed or a many-ridged surface, so that the user's thumb/finger may grip and rotate the cincture to rotate the cincture-igniting wheel combination. When users use ordinary strength to rotate the combined igniting wheel and cincture unit (simultaneously), the igniting wheel movement relative to the flint will result in friction to generate sparks, and the purpose of igniting the lighter can be achieved when the lever press plate is depressed at the same time to release fuel. However, a simple lighter such as this cannot effectively avoid various risks caused by ignition of the lighter when a child plays with the lighter, as sparks may be fairly easily generated when the combined igniting wheel and the cincture unit is rotated accidentally. One modification of this simple lighter that is currently in the marketplace is a simple lighter with a guard extending over the otherwise-exposed portion of the igniting wheel, so the user's thumb/finger must only contact and rotate the toothed/ridged cinctures to rotate the cincture-igniting wheel combination.

[0005] As it is known that the disposable lighter is common and relatively cheap, it is impossible to incorporate expensive and complex safety devices which greatly

increase the cost of the lighter. Such expensive safety devices in a disposable lighter simply would not be tolerated by the economics of the marketplace.

[0006] In order to provide safe use of a disposable lighter and avoid dangers caused by accidental ignition of lighters such as the "simple safety lighter" described above, various measures have been adopted. In order to minimize the manufacturing cost of a disposable lighter with a safety ignition unit, one of the most common types of disposable safety lighters is the drive wheel type disposable safety lighter. This type of disposable lighter comprises a pair of drive wheels driving the striker wheel to rotate in order to generate sparks, wherein the drive wheels normally run idle in order to prevent unwanted ignition when the driving wheels are physically disengaged with the striker wheel. In these prior art safety lighters, therefore, some means of the drive wheels disengaging and engaging the striker wheel must be provided.

[0007] The "driver-igniter" disengagement and engagement type of safety device, and other types of safety devices are discussed in more detail below:

1. Goal: Make the operation of ordinary lighters more difficult in restricting the use of such lighters by young children. It is for this purpose that U.S. Pat. Nos. 5,002,482 and 7,004,750 B2 disclosed a child-resistant device, incorporated with a relief mechanism to block the gas fuel and to prevent ignition of the lighter by pressing the safety ring downward.

[0008] A disposable lighter with safety ignition unit is shown in U.S. Pat. No. 7,004,750 B2, wherein a striker wheel and two gear elements form a combined unit. Each gear element comprises a gear wheel with teeth, an inner support shank, and an outer supporting shaft (all integral parts of the gear element). The inner support shanks each comprise a wheel axle that is fixed to the striker wheel, and a support wheel that has a width adapted to provide a "supporting gap" between an end surface of the striker wheel and the end (inner side) of the gear wheel. Each gear element's support wheel is smaller in diameter than its gear wheel. The two gear elements, specifically, the outer supporting shafts of the gear elements, are arranged for respectively and rotatably mounting to two supporting walls in such a manner that the combined unit (striker wheel fixed to gear elements by fixed connection between the striker wheel to the wheel axles of the two gear elements) is capable of being driven to rotate when the two gear wheels are driven to rotate.

[0009] Encircling the combined unit at each of said support gaps, that is, encircling each of the support wheels and each of the gear wheels, are two driving caps, which each have an outer perimeter "driving ring" portion with an outer circumferential "slipping" surface. Each driving cap has a central support hole, receiving the support wheel of its respective gear element, which central support hole is slightly larger in diameter than the diameter of the support wheel. Each driving cap also has a circular driving cavity formed within the driving ring and the inner sidewall, wherein each of the driving cavities has a diameter larger than that of its respective toothed gear wheel. Thus, each driving cap is freely rotatably mounted in its respective supporting gap, and in its position "overhanging" its respective gear wheel. Still, the driving caps are arranged to engage with their respective gear wheels, by means of driving teeth in the driving cavity that engage the teeth of the gear wheel

upon an adult pressing down on the driving cap. This way, the force applied by an adult will move the driving caps down relative to the gear element, engaging the cavity driving teeth with the gear wheel teeth, so as to drive the combined unit (the gear element and the striker wheel fixed together) to rotate for striking the strike wheel against the flint supported by a spring to produce sparks, thereby igniting the lighter. However, the present inventor notes that the presence of the driving cavity makes it difficult to ensure the most proper engagement between the driving caps and the gears of driving wheels, thus causing the ignition operation somewhat difficult.

2. Another disposable lighter, disclosed in U.S. Pat. No. 6,494,709, comprises a striker wheel coaxial with, and fixed to, two driving wheels to make a combined unit. Each of the two driving wheels has an outer circumferential toothed surface. A child resistant device is provided, wherein the safety device comprises a pair of disc-ring units (shelter ring combined, and integral, with said protection disc). The inner diameter of each shelter ring is larger than the outer diameter of the driving wheel so as to define a safety gap between an inner circumferential surface of the shelter ring and the circumferential teeth surface of the driving wheel. Importantly, however, the shelter ring has a width shorter than a thickness of the driving wheel, thereby defining an uncovered portion of the circumferential teeth surface of the driving wheel, which uncovered portion of the teeth surface serves as the surface contacted by the user for actuating movement of the combined unit. In other words, the uncovered portion of each driving wheel toothed surfaced serves as the "actuating edge" that is contacted by the user, and moving said actuating edge moves the driving wheel, which, due to the fixed connection between the driving wheel and the striker wheel, moves the combined unit of which the striker wheel is a part.

[0010] In order to ignite the disposable lighter, an adult's thumb must be intentionally pressed on the shelter wheels downward until his or her thumb's surface extends through/past the safety gaps (between the shelter ring and the driving wheel) to come in contact with the uncovered portion of the teeth portion (that is, to come in contact with the "actuating edges") of the driving wheels. By the user thus rotating the driving wheels at the actuating edges, the striker wheel is driven to be rotated to ignite the disposable lighter. The patent disclosing this lighter teaches specifically that the adult thumb will only contact the driving wheels (the uncovered actuating edges) but not the striker wheel, such that no residue on the striker wheel will stick to the adults' thumb after every ignition of the disposable lighter.

[0011] A child's thumb is relatively short, and thus not capable of contacting the uncovered edges of the driving wheels, therefore the purpose of preventing the child from accidentally igniting the lighter is obtained. However, the present inventor notes that, since the fingers of the adults are greatly inconsistent in length, the design and manufacture of the safety gap and the "uncovered portion" of the drive wheels are of great difficulty. In addition, even if a safety gap is designed, it does not necessarily suit each adult user.

3. Safety has been improved in some lighters by adding relatively expensive new components. For instance, an elastic sheet controller has added to form a set of safe switches by using the recess located beneath the lever press plate of the existing simple-type igniter and on the top of the body, wherein there is a vertical plate beneath the front end of the

controller (note: the plate is narrower and thinner on the upper portion and wider and thicker on the lower portion), and there is a through-hole in the plate of the controller. When in normal conditions, the controller is in a lower position, and the through hole of the upper plate is displaced with a protrusion beneath the lever press plate. By virtue of this condition, the safety feature in which gas cannot escape is achieved. However, if the controller is pushed inwardly and upwardly, then the through hole of the plate of the controller is engaged with the protrusion beneath the lever press plate, such that the controller cannot block the gas. At the time, the lever press plate is depressed together with the controller such that gas is released to ignite. However, when the lever press plate is released and moved upward, since the plate of the controller is narrower and thinner on the upper portion and wider and thicker on the lower portion, the pressing of the plate and the elastic sheet together keeps the controller in the lower position, at the time, the protrusion beneath the raised lever press plate is displaced with the through hole of the plate again, and the safety condition in which the lever press plate cannot be depressed is resumed. This improvement measure has indeed improved the safety of the igniter, but it also leads to higher design and production cost.

[0012] Whichever measure is used, there will be some drawbacks, such as increase in cost due to increase of design works, assembly and materials, higher selling price or lower profit; therefore, these measures are impractical for widespread use. The present invention, however, provides a simple and low-cost disposable lighter with an effective safety ignition unit, which prevents the disposable lighter from being ignited accidentally.

SUMMARY OF THE INVENTION

[0013] Aiming to solve the drawbacks of the existing technologies, the present invention provides a disposable lighter with a safety ignition unit, which is characterized by its reasonably-structured design, low cost, and effectiveness in avoiding dangers caused by ignition of the lighter by children or by errors in operation.

[0014] The purpose of the present invention is to, by means of changes to ordinary lighters, provide a lighter that is more convenient for adults and more difficult for children's operation. Said changes may be relatively small and economical to design and produce, especially when compared to the prior art attempts at safety solutions, but are very effective in operation and safety.

[0015] The present invention comprises a disposable lighter with a safety ignition unit comprising an adapted cincture system, wherein smooth, preferably freely-rotating cinctures are provided that encourage a child's thumb or finger to slide off of the ignition unit, and that make accidental ignition unlikely, while allowing an adult thumb with purposeful, sufficient force to reach the igniting wheel for direct contact with, and actuation of, the igniting wheel.

[0016] The preferred embodiments comprise a body and a head, wherein arranged on said head are a nozzle, a adjustment ring, a wind mask or "flame guard," a lever press plate, a spring, a flint, a wheel bracket system or "outer head," and an igniting wheel set with safety device, wherein said igniting wheel set with safety device includes two central axles, two cinctures, and an igniting wheel that is used to make friction with said flint so as to generate sparks. Said two cinctures are located at each end of said igniting wheel

respectively, and the inner diameter of each cincture is slightly larger than the outer diameter of the respective axle/wheel that it surrounds (preferably, a portion of central axle), so as to allow the free rotation of each cincture relative to the rest of the igniting wheel set, so that each cincture becomes what may be called a "sliding wheel." Said two central axles are supported on said bracket and act as common rotational axle of said cinctures and igniting wheel, wherein the cincture is generally coaxial with but rotates relative to the central axle, while the igniting wheel is coaxial with and rotates with the central axle. Said cinctures each have a preferably smooth outer circumferential surface, to encourage a child's finger, or accidental contact, to slide off of the cinctures and, so, not to actuate the igniting wheel set to ignite the lighter.

[0017] Preferably, the gap between said cincture (the cincture inner diameter) and said central axle (the outer diameter of the portion of the central axle that the cincture encircles) is 0.1 mm, but it may be other sizes. The dimension of the cincture can be used to control the contact of the user's thumb with the igniting wheel. For example, a gap of 0.1 mm between the cincture and the central axle can reduce the friction between the cincture and the central axle sufficiently so as to make the ignition more difficult.

[0018] The surface of the top of the preferred cincture is comparatively smooth and the cincture rotates along the direction of the pressing force so that the user has good hand feel. This good hand feel is more comfortable than the user having to rotate a toothed gear or wheel, for example.

[0019] Said central axle preferably comprises an outer axle supported on said bracket, a middle axle inserted in said cincture, and an inner axle inserted into, and fixed (or at least frictionally-engaged or interference-fit into) to an axial hole of the igniting wheel. Thus, mounted, movement of the igniting wheel backwards will generate sparks and this could be accomplished, in the absence of the cinctures, by pressing the igniting wheel rearward, or the central axles rearward. The preferred cinctures, however, prevent or substantially prevent this for children's finger, or accidental, contact.

[0020] The middle axle of said central axle, the inner axle of said central axle, the axial hole of said igniting wheel, and the inner diameter surface of the cincture preferably have a polygonal structure, but may also have a smooth structure. Preferably, the middle axle and inner diameter surface of the cincture do not have teeth, that is, they do not have protrusions as sharp and narrow as teeth, or the cooperating indents, that would engage as toothed gear engage; it is preferred that, when a user presses on the cinctures (but does not reach the igniting wheel) that the force of the cinctures does not engage the central axle as teeth would, but rather the cinctures rotates freely or substantially freely, only stabilized and/or slightly engaged by the preferred, but optional, polygonal surfaces.

[0021] Compared with the existing technologies, the preferred embodiments of the invention have the following advantages: greatly improvement in the safety features of the lighter without changing the original structure of the existing simple lighter (described earlier in this Description) or adding any substantial or complex components; avoiding accidental ignition by simply improving individual components of the lighter; making the operation more convenient and reducing the manufacturing costs. In addition, it can also effectively prevent accidents when a child plays with the lighter, effectively avoiding dangers caused by accidentally

rotating the igniting wheel to generate sparks during transportation and carrying. Therefore, it is practicable, cost-effective and can be widely used in the production of lighters.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] FIG. 1 is an exploded view of one embodiment of the disposable lighter with safety ignition feature.

[0023] FIG. 2 is a perspective view of one embodiment of the invented ignition wheel set, that is, the ignition wheel set of the embodiment of FIG. 1.

[0024] FIG. 3 is an exploded view of the ignition wheel set of FIGS. 1 and 2.

[0025] FIG. 4 is a schematic side view of a disposable lighter such as the embodiment in FIGS. 1-3, illustrating the pieces-parts of the lighter including some of the internals.

[0026] FIG. 5 is an exploded view of the schematic disposable lighter of FIG. 4.

[0027] FIG. 6 is an exploded perspective view of another embodiment of disposable lighter according to the invention.

[0028] FIG. 7 is an exploded perspective view of the igniting wheel set with safety device of the embodiment of FIG. 6 (Note that the innermost apertures 312 are shown larger than the preferred diameter, which preferred diameter is slightly larger than the diameter of the middle axle 323 and yet not as large as the outer diameter of the igniting wheel 33 so that the cinctures do not slide inward axially toward the middle region of the igniting wheel).

[0029] FIG. 8 is a cross-sectional view of the igniting wheel set with safety device according to the embodiment of FIGS. 6 and 7.

[0030] FIG. 9 is a schematic view of an adult user's thumb igniting the lighter using an embodiment of the invented igniting wheel set with safety device, wherein the adult user's thumb is capable of sufficient force to contact and turn the igniting wheel.

[0031] FIG. 10 is a schematic view of a child's thumb trying to ignite the lighter, wherein the child's thumb cannot contact the igniting wheel due to insufficient force, and, hence, cannot turn the igniting wheel to ignite the lighter.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] Referring to the Figures, there are shown some, but not the only embodiments, of the invented igniting wheel set with safety device, and the invented lighter comprising said igniting wheel set.

[0033] Referring to FIGS. 1, 4-6, safe lighters 100, 100' with safety ignition unit includes a body B and a head H. The body comprises a fuel tank 10 encasing lighter fuel, a wick housing 4, and a wick 5. On or underneath the head H are installed valve/nozzle 11, an adjustment ring 2, a wind mask 1, a lever press plate 6, outer head 9, an igniting wheel set 3 with safety device, spring 8, and a flint 7, a conduction core 5. Parts of the lighter valve/nozzle system are shown in FIG. 5, for example, nozzle body 112, nozzle O-ring 112, nozzle spring 114, nozzle member 115, T-valve 116, nozzle lid 117, body O-ring 118, nozzle washer 119, and sponge filter 120.

[0034] Referring to FIGS. 2, 3, 6 and 7, the igniting wheel set 3, 3' with safety ignition device is shown to best advantage. The igniting wheel set 3, 3' includes two central axles 32, two cinctures 31, and an igniting wheel 33 which

is used to make friction with the flint 7 so as to generate sparks. The two cinctures 31 are located at each end of the igniting wheel 33, respectively, and the inner diameter (312) of the cincture 31 is slightly larger than the structure on which it rotates, so as to allow the rotation of the sliding wheel. Preferably, the cinctures 31 rotate on the two central axles 32 and so, the inner diameters (of the inner apertures 312) of the cinctures 31 are slightly larger than the outer diameters of the portion of the central axles 32 on which the cinctures rotate. Alternatively, the cinctures may be designed to encircle and rotate on some other portion of the igniting wheel set, such as the igniting wheel itself, in which case the inner diameters of the cinctures would need to be slightly larger than the outer diameter of the igniting wheel and there would need to be adaptation to keep the cinctures from sliding to the middle of the igniting wheel; this, however, is less preferred than the embodiment wherein the cinctures rotate on the central axles.

[0035] The two central axles 32 are supported on the bracket 911 of the outer head 9 and act as common rotational axle of the cincture 31 and igniting wheel 33 (the cincture preferably rotating freely on the axle and the igniting wheel being fixed to the axle).

[0036] Each central axle 32 is composed of an outer axle 321 supported on the bracket 911 of the outer head 9, a middle axle 323 inserted in the innermost aperture 312 of the cincture, and an inner axle 324 inserted in axial hole 332 of the igniting wheel 33.

[0037] Referring to FIG. 3, the surface 312' of the innermost aperture 312 of the cincture 31, the surface 323' of the middle axle 323 of the central axle 32, the surface 324' of the inner axle 324 of the central axle 32 and the axial hole 332 of the igniting wheel 33, preferably have a polygonal structure. The innermost aperture 312' surface and middle axle surface 323' are twelve-sided, and it is between these surfaces that there is preferably a small gap (such as 0.1 mm). The polygonal surface allows some small or "slight" engagement of the cincture with the middle axle, when an adult presses down on the cincture and thereby closes the gap, but typically does not allow engagement of the cincture of the middle axle when a child presses down on the cincture. The small or slight engagement in the polygonal interface, when a person exerting sufficient force presses down on the cinctures, serves to allow some slight amount of driving of the central axle 32 by the cincture, and, hence, of the axle 324 and the igniting wheel fixed thereto. In other words, in some embodiments, some force can be generated by closing the gap between cincture 31 and the central axle 32, and applying sufficient force on the cincture(s).

[0038] This small or slight engagement preferably involves polygonal surfaces of more than 6 sides, and preferably but not necessarily 6-14 sides. Surfaces 312' and 323', and the slight engagement between them, preferably do not comprise what may be called "teeth," "gears," or a "gear engagement" that is, it does not involve sharp or significant protrusions or sharp or significant recess that would mate with teeth.

[0039] Referring still to FIG. 3, the surface 324' of the inner axle 324 and the cooperating surface of the igniting wheel axial hole 332 are polygonal, but typically have more than 12 sides. These polygonal surfaces serve to provide a good friction or interference fit, and/or to provide good

connection surfaces for other means of connecting the inner axle 324 and igniting wheel 33, such as welding, adhesive, or other fastening means.

[0040] Referring to FIG. 7, an alternative lighter (100') igniting wheel set (3') includes surface 312" of each cincture and surface 323" of each middle axle that are smooth, rather than polygonal. Such an embodiment may be desirable, as the cincture rotates very freely on the middle axle and is very helpful in preventing a child from igniting the lighter, as there is very little friction of the cincture with the middle axle, so there is little or no "rotational engagement" of the cincture with the middle axle, and, hence, little or no driving of the middle axle by the cincture.

[0041] Alternatively, some or all of these structures may have other shapes or textures, but, preferably, these structures do not have teeth or other significantly protruding, or significantly recessed, mating features.

[0042] The cincture 31 is a smooth cincture on its outer perimeter, and its innermost aperture diameter is sized to provide a gap between the cincture 31 and the central axle middle axle 323 (specifically, surface 323', 323") of approximately 0.1 mm. Other gaps may be used, but a gap approximately of this dimension is preferred. This way, the cinctures freely or nearly freely rotate, and they tend not to engage the central axle in a way that will cause rotation of the central axle when the cinctures rotate, at least, not to engage the central axle in a way that will cause rotation of the central axle when the cinctures are rotated by the force of which a child is capable. This preferred free or nearly free rotation, even upon pressing down of the cincture, is provided in part because the preferred central axle and cincture do not have teeth. Some friction or some engagement between the innermost aperture surface and the central axle may be caused by the preferred polygonal shapes of these surfaces, as discussed above, but not to the extent that would be caused by teeth. Still, even with some friction or engagement by the cincture, the main actuation force, as will be further explained later, is an adult's user's thumb pressing down hard enough to contact and move the igniting wheel itself.

[0043] The outer perimeter of each cincture is a slip ring portion 313, and its surface 313' is a smooth circular/cylindrical surface. Thus, the slip ring portion is exposed generally at the top of the lighter, when all components such as the cincture 31, central axle 32 and igniting wheel 33 are connected and mounted on the brackets 911.

[0044] Referring to FIGS. 3 and 8, one may see that the preferred cinctures extend radially out along the main discs 320 of their respective central axles 32, and the slip ring portion 313 of each cincture extends axially outward across the outer perimeter surface 320' of the main disc 320. Preferably, there is also a gap between the inner surface 313" (of the slip ring portion 313) and the outer perimeter surface 320' of the main disc 320. This gap, like the gap between the cincture and the middle axle, preferably is about 0.1 mm, but may be other amount; this gap is also intended to allow free or nearly free rotation of the cincture 31 relative to the central axle 32. Preferably, the inner surface 313" of the slip ring portion is smooth, does not have teeth and does not engage the main disc outer perimeter surface 320' to any significant extent even when the cinctures are pressed down. One may see, in FIGS. 3 and 8, that the slip ring portion 313 preferably completely covers the radially-extending side surface 320" and preferably completely covers the outer perimeter surface 320', so that the user may not contact

surface 320' or the main disc 320 at all. In this way, the invented safety system adds the invented cinctures 31, which cover the central axles 32 (or conventional driving members that connect to the ends of the igniting wheel in the conventional "simple lighter")

[0045] Referring to FIGS. 9 and 10, there are shown comparisons of how the preferred safety device works when an adult user and a child user try to light the lighter. The finger/thumb of the user must be able to push down with sufficient force to reach, and have full contact with, the igniting wheel 33 and sufficient strength should be applied to rotate the igniting wheel 33 so as to generate sparks.

[0046] Referring to FIG. 9, the adult finger/thumb TA is capable of pressing on the ignition wheel set so that a portion of the finger/thumb extends between the cinctures to contact the igniting wheel 33. It is this contact and force upon the wheel 33, and optionally some small or slight engagement between the pressed-down cinctures and the central axles, that drives the igniting wheel 33. Thus, direct contact between the user's finger/thumb and the wheel 33 is desired and necessary.

[0047] Referring to FIG. 10, the cincture runs idle when the finger/thumb TC of the user does not fully contact with the igniting wheel 33 and no sufficient strength is applied to rotate the igniting wheel 33.

[0048] The present invention greatly improves the safety features of the igniter without changing the original structure of the igniter or adding any complex or expensive component. The original "simple lighter" design may be used, and the invented cinctures may be added with little or no modification of the simple lighter design. It is convenient for use, cost-efficient, capable of effectively avoiding any accident or danger.

[0049] When a user uses ordinary strength (equal to that used on an ordinary lighter, rather than the enhanced/increased "sufficient" strength needed to operate the invented lighter) to rotate the igniting wheel set 3 with safety device, since the outer diameter of the cinctures (at slip ring portion 313 and surface 313') are larger than the outer diameter of the igniting wheel 33, the thumb cannot touch the igniting wheel 33, or, if it does touch the wheel 33 slightly, its strength cannot move the igniting wheel 33. In such a case, the cincture 31 and the igniting wheel 33 (including the central axle) cannot rotate or stop simultaneously, therefore, only the cinctures 31 are rotated. Even if the thumb further depresses the lever press plate to discharge the fuel, ignition does not occur, because the igniting wheel 33 (including the central axle) does not rotate to make friction with the flint to generate sparks. In this manner, it can effectively avoid dangers caused by ignition of the lighter when a child plays with the lighter or the igniting wheel is rotated by mistake.

[0050] When a user uses more strength (which is substantially greater than that used on an ordinary lighter) to rotate the igniting wheel set 3 with safety device to generate sparks, the thumb, while moving the cinctures 31, will also directly contact with and rotate the igniting wheel 33 to make friction between the igniting wheel 33 and the flint and generate sparks. At that time, the thumb will further depress the lever press plate to discharge fuel and ignite the lighter.

[0051] In preferred embodiments, therefore, it may be said that the disposable lighter with safety ignition unit is comprised of a body and a head, wherein a nozzle, a ring, a wind mask, a lever press plate, a spring, a flint, a bracket and an

igniting wheel set are arranged on said head, said igniting wheel set includes two central axles joined to a central igniting wheel to form an axle-igniting-wheel combination, wherein the igniting wheel is adapted to make friction with said flint so as to generate sparks, and two cinctures located on each end of said igniting wheel and encircling a portion of the axle-igniting-wheel combination, wherein the inner diameter of each of said cinctures is slightly larger than the outer diameter of said portion to create a gap, so the cinctures are adapted to rotate relative to the axle-igniting wheel combination, and said two central axles are supported on said bracket and act as a common rotational axle of said cinctures and igniting wheel. Each of said cinctures may be a smooth cincture having a smooth outer perimeter. The gap between said cincture and said axle-igniting wheel combination may be 0.1 mm, which reduces friction between said cinctures and said combination to make ignition more difficult. The gap between the cincture and said combination can be used to reduce the friction, make the ignition more difficult, and give the user good hand feel. Said central axle may be composed of an outer axle supported on said bracket, a middle axle inserted into said cincture, and an inner axle inserted in an axial hole of said igniting wheel. An inner surface of said cincture, the middle axle of said central axle, inner axle of said central axle, and the axial hole of said igniting wheel may have a polygonal structure. Said polygonal structure may be a polygonal structure with more than six sides. Between said central axle and said cincture there may be a polygonal interface used to connect the devices moving inwardly. Sufficient strength must be applied to rotate the igniting wheel so as to generate sparks. Each of said central axles may comprise a main disc having a radial surface facing said igniting wheel and an outer perimeter generally cylindrical surface, and said igniting wheel set and igniting wheel may be adapted to ignite only if said igniting wheel is forced to move by a user. The cinctures preferably cover said central axle radial surface and said outer perimeter surface so that the user does not touch said radial surface or said outer perimeter surface, and, instead, a user must directly contact the igniting wheel in between the cinctures in order to rotate the igniting wheel and ignite the lighter.

[0052] Although this invention has been described above with reference to particular means, materials and embodiments, it is to be understood that the invention is not limited to these disclosed particulars, but extends instead to all equivalents within the scope of the following claims.

1. A disposable lighter with safety ignition unit comprised of a body and a head, wherein a nozzle, a ring, a wind mask, a lever press plate, a spring, a flint, a bracket and an igniting wheel set are arranged on said head, said igniting wheel set includes two central axles joined to a central igniting wheel to form an axle-igniting-wheel combination, wherein the igniting wheel is adapted to make friction with said flint so as to generate sparks, and two cinctures are located on each end of said igniting wheel and encircling a portion of the axle-igniting-wheel combination, wherein the inner diameter of each of said cinctures is slightly larger than the outer diameter of said portion to create a gap, so the cinctures are adapted to rotate relative to the axle-igniting wheel combination, and said two central axles are supported on said bracket and act as a common rotational axle of said cinctures and igniting wheel.

2. A disposable lighter with safety ignition unit according to claim 1, wherein each of said cinctures is a smooth cincture having a smooth outer perimeter.

3. A disposable lighter with safety ignition unit according to claim 1, wherein said gap between said cincture and said axle-igniting wheel combination is 0.1 mm, which reduces friction between said cinctures and said combination to make ignition more difficult.

4. A disposable lighter with safety ignition unit according to claim 2, wherein said gap between said cincture and said axle-igniting wheel combination is 0.1 mm, which reduces friction between said cinctures and said combination to make ignition more difficult.

5. A disposable lighter with safety ignition unit according to claim 3, wherein the gap between the cincture and said combination can be used to reduce the friction, make the ignition more difficult and give the user good hand feel.

6. A disposable lighter with safety ignition unit according to claim 4, wherein the gap between the cincture and igniting wheel can be used to reduce the friction, make the ignition more difficult and give the user good hand feel.

7. A disposable lighter with safety ignition unit according to claim 1, wherein said central axle is composed of an outer axle supported on said bracket, a middle axle inserted into said cincture, and an inner axle inserted in an axial hole of said igniting wheel.

8. A disposable lighter with safety ignition unit according to claim 2, wherein said central axle is composed of an outer axle supported on said bracket, a middle axle inserted into said cincture, and an inner axle inserted in an axial hole of said igniting wheel.

9. A disposable lighter with safety ignition unit according to claim 7, wherein an inner surface of said cincture, the middle axle of said central axle, inner axle of said central axle, and the axial hole of said igniting wheel have a polygonal structure.

10. A disposable lighter with safety ignition unit according to claim 9, wherein said polygonal structure is a polygonal structure with more than six sides.

11. A disposable lighter with safety ignition unit according to claim 1, wherein between said central axle and said cincture there is a polygonal interface used to connect the devices moving inwardly.

12. A disposable lighter with safety ignition unit according to claim 1, wherein sufficient strength must be applied to rotate the igniting wheel so as to generate sparks.

13. A disposable lighter with safety ignition unit according to claim 1, wherein each of said central axles comprise a main disc having a radial surface facing said igniting wheel and an outer perimeter surface, and wherein said igniting wheel is adapted to ignite only if said igniting wheel is forced to move by a user and wherein said cinctures cover said central axle radial surface and said outer perimeter surface so that a user cannot contact said axle radial surface and said outer perimeter surface and the user must directly contact the igniting wheel in between the cinctures in order to rotate the igniting wheel and ignite the lighter.

14. A disposable lighter with safety ignition unit according to claim 1, wherein an inner surface of said cincture and an outer surface of said middle axle are both smooth, for reducing friction between said cincture and said middle axle.

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