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(54) **FLAMELESS LIGHTER**

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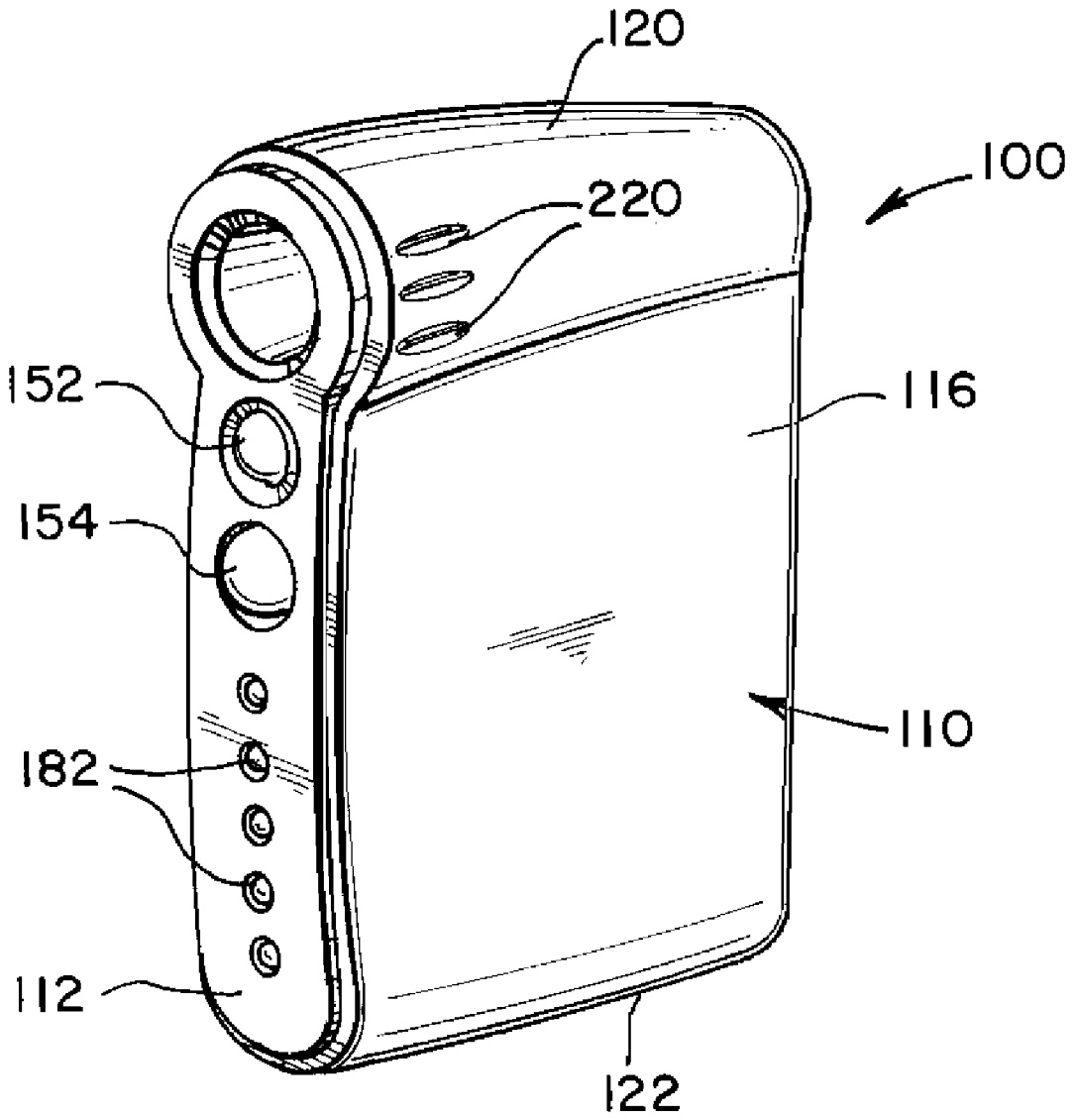
(57) **ABSTRACT**

A lighter includes (1) a housing; (2) a rechargeable electric power source contained in the housing; (3) a heating element operatively connected to the power source; (4) an actuator for selectively connecting the heating element to the power source resulting in electricity being delivered to the heating element to cause heating thereof; and (5) a first feature for indicating a charge level of the power source and for indicating when the heating element is at an optimal temperature for igniting an object. The first feature can also indicate the charge level when the device is being charged.



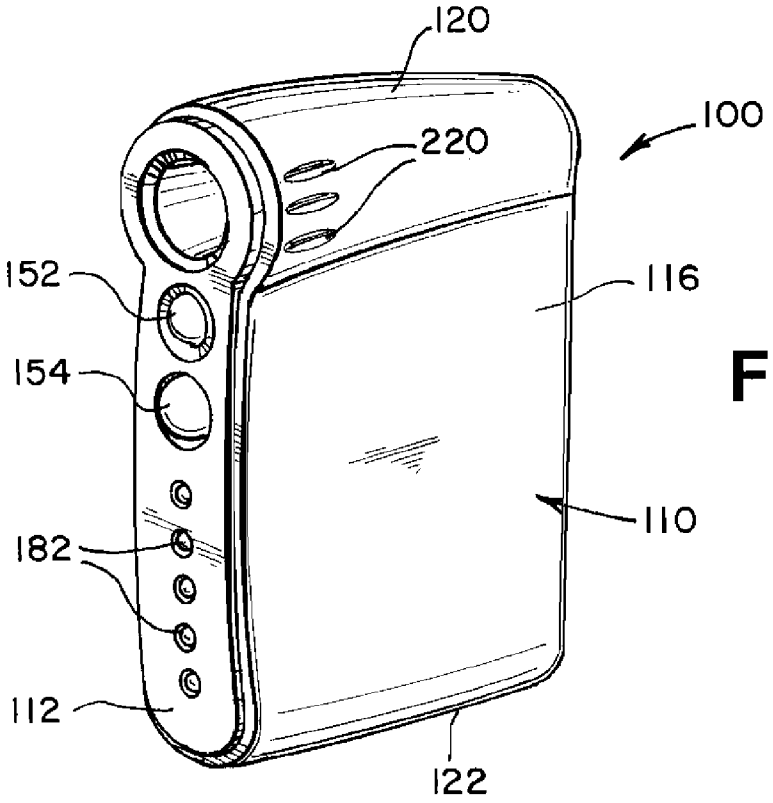

120
100
220
152
116
154
110
182
112
122

FIG. 1

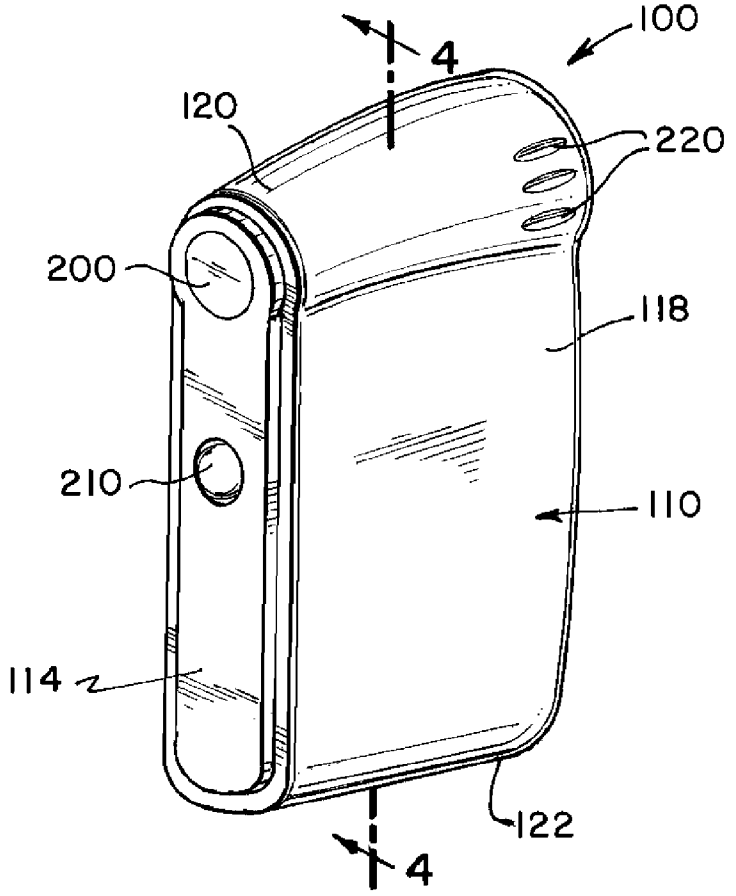

4
100
120
220
200
118
210
110
114
122
4

FIG. 2

FIG. 3

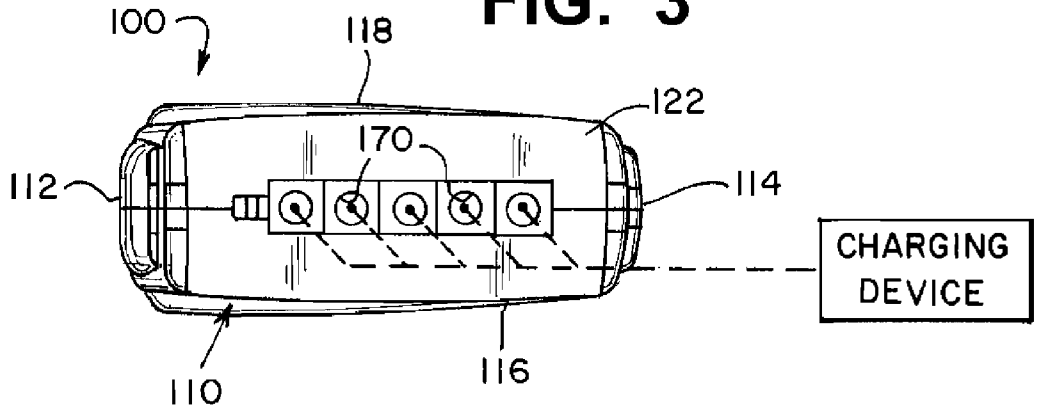
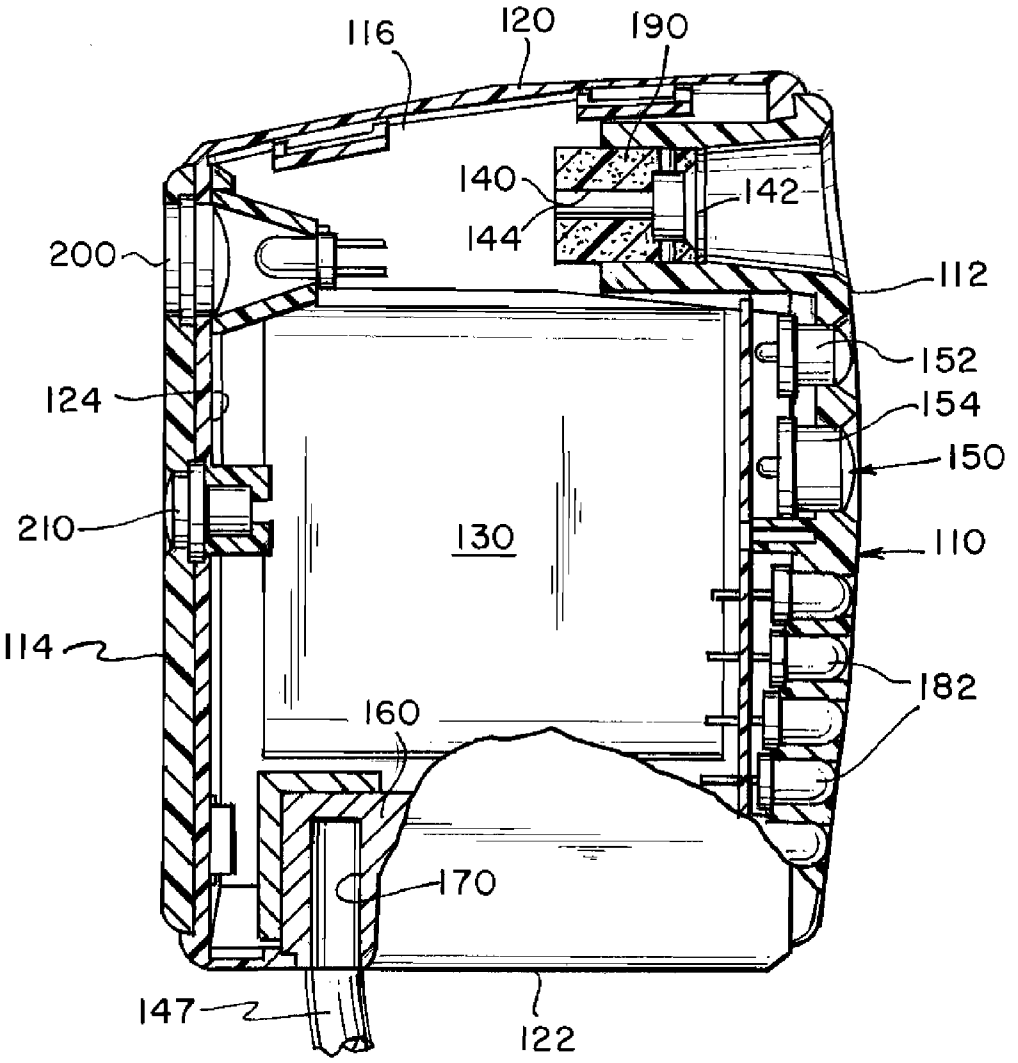

100
118
122
170
112
114
CHARGING DEVICE
110
116

FIG. 4


116
120
190
140
142
144
200
112
152
124
154
150
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130
110
114
182
160
170
147
122

FIG. 5

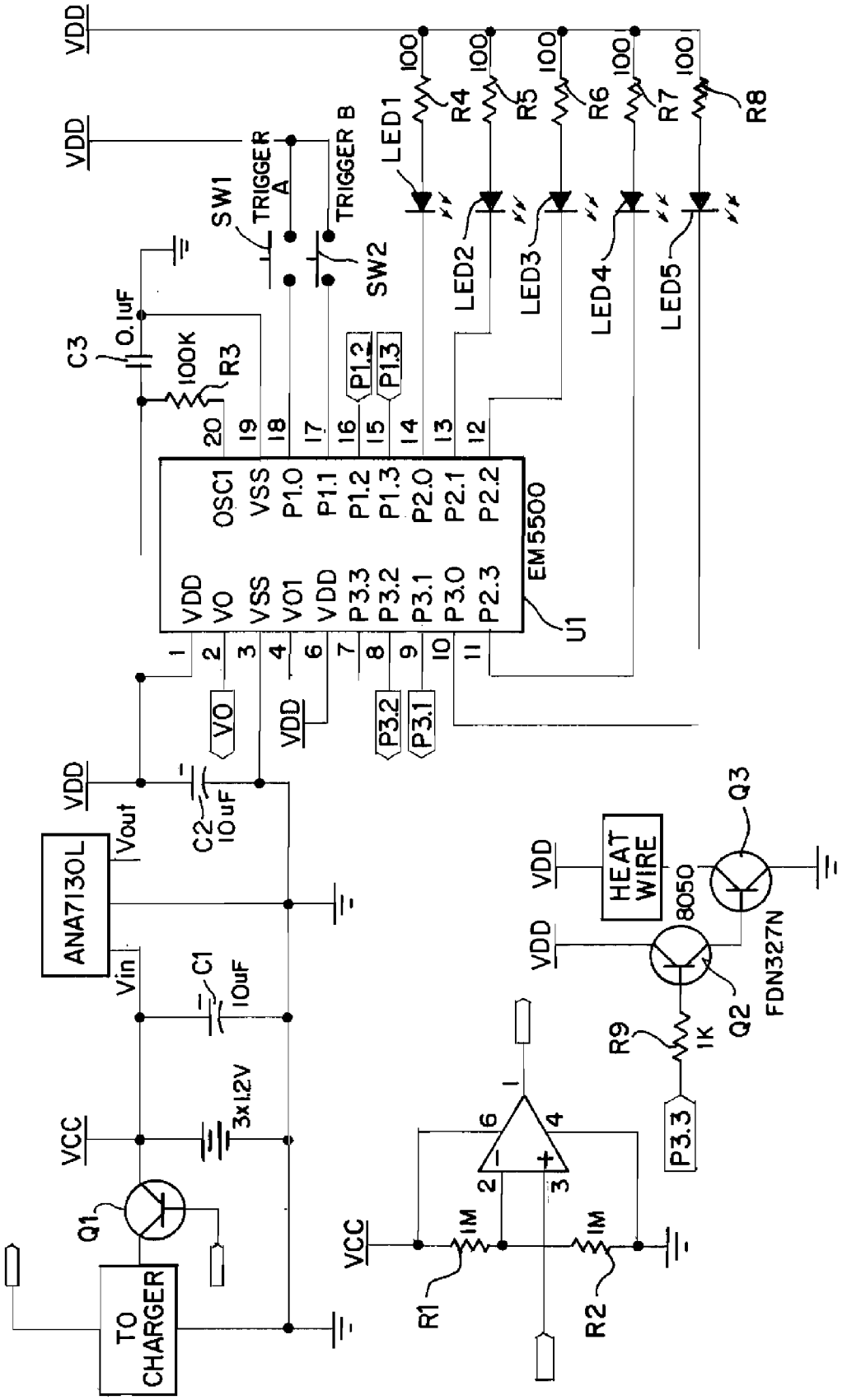
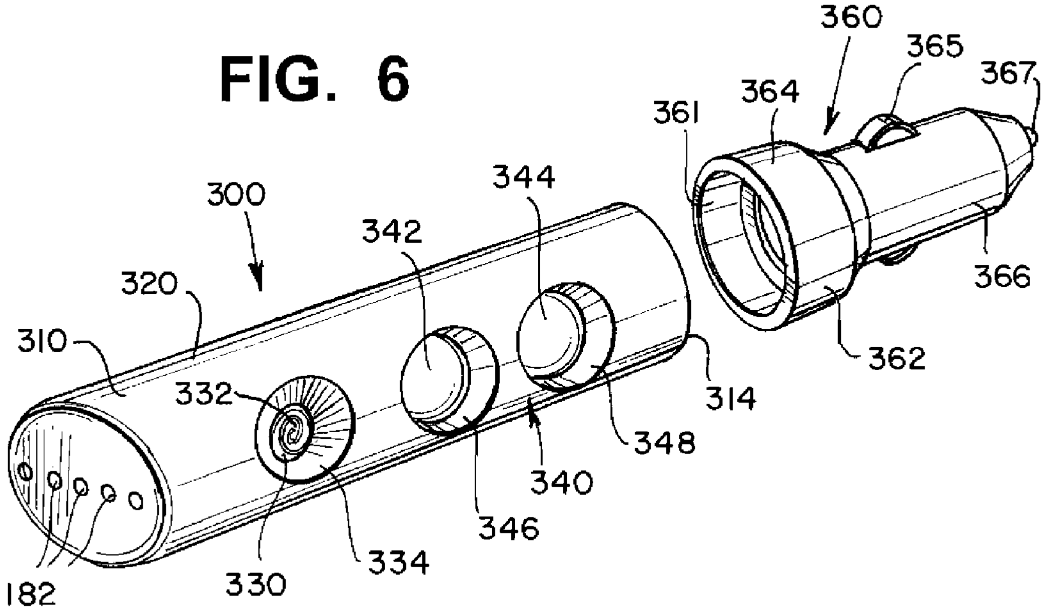

VDD
VDD
VDD
SW1
TRIGGER A
TRIGGER B
SW2
LED1
LED2
LED3
LED4
LED5
R4
R5
R6
R7
R8
100
C3
0.1uF
100K
R3
P1.2
P1.3
EM5500
U1
OSC1
VSS
P1.0
P1.1
P1.2
P1.3
P2.0
P2.1
P2.2
VDD
VO
VSS
VO1
VDD
P3.3
P3.2
P3.1
P3.0
P2.3
VO
VDD
P3.2
P3.1
C2
10uF
ANA7130L
Vout
Vin
C1
10uF
3x1.2V
VCC
Q1
TO CHARGER
HEAT WIRE
8050
Q3
FDN327N
Q2
R9
1K
P3.3
R1
R2
1M
1M

FIG. 6



360
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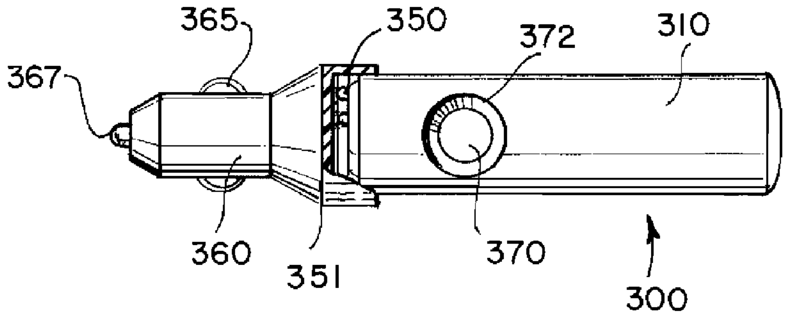
367
364
361
344
300
342
320
310
332
314
348
340
346
334
330
182
366
362

FIG. 7



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310
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360
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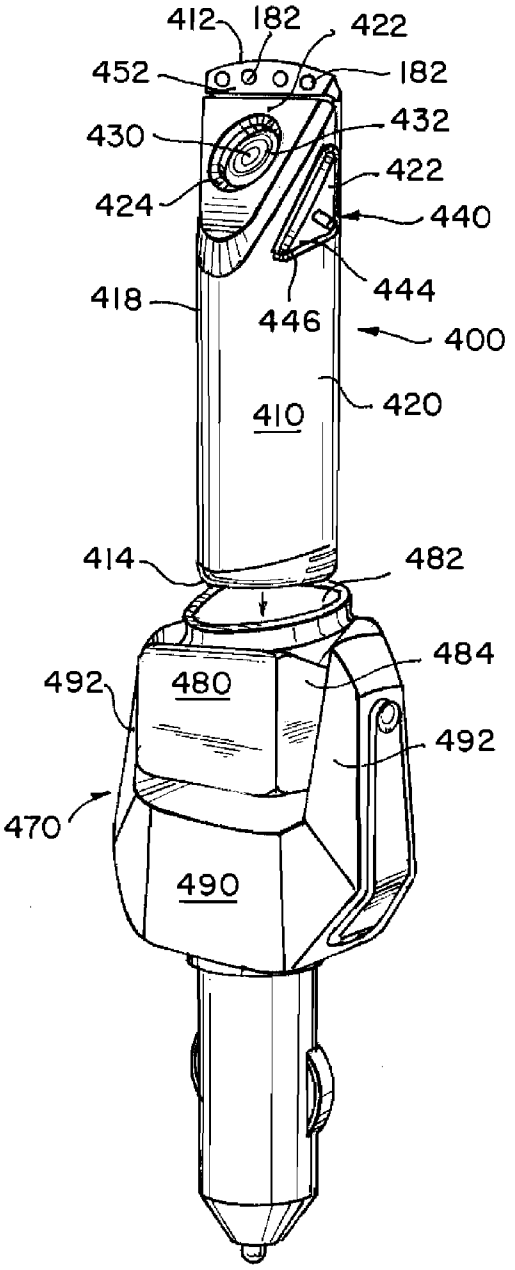
300

FIG. 8


412
182
422
452
182
430
432
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444
418
446
400
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410
414
482
484
492
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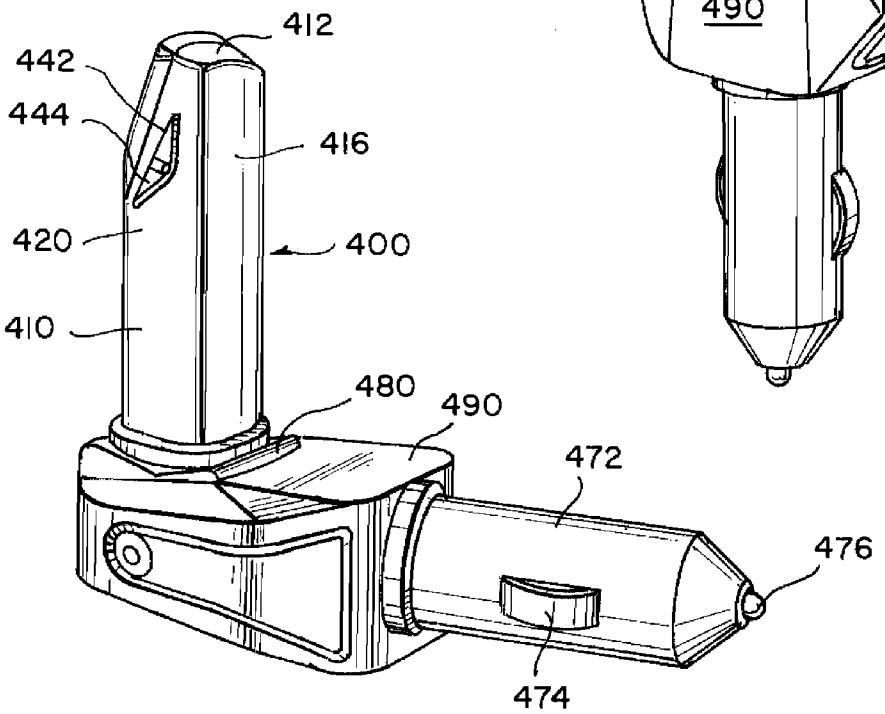
492
470
490

FIG. 9


412
442
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416
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472
476
474

FLAMELESS LIGHTER

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims the benefit of U.S. patent application Ser. No. 60/709,084, filed Aug. 16, 2005, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates to a lighter apparatus and, in particular, to a flameless lighter that includes a number of safety improvements and features that expand the scope of use of the lighter.

DESCRIPTION OF RELATED ART

[0003] Lighters and the like are used in a number of different applications that require an object to be ignited due to placement of the object in close proximity or in contact with the lighting means of the lighter. One of the most prevalent and common applications is the lighting of tobacco products, such as cigarettes, cigars, etc. As is well known, a lighter is most often used to ignite a tip of the tobacco product to permit smoking thereof. Other applications where a lighter is used include but are not limited to the lighting of candle, incense, or other combustible fragrant or luminary object.

[0004] While lighter devices have been incorporated into the interiors of vehicle and the like, it is preferred that the lighter be constructed so that it has mobility and can be easily taken by the user from one location to another location as by simply placing the lighter in a pocket, a bag, etc. The most common type of lighter is a hand-held lighter that contains either an ignition element or means that produces a spark and a flammable fluid that is stored proximate to and in selective fluid communication with the ignition element. The operation of the ignition element causes a spark to be generated and the flammable fluid is placed in fluid communication with the spark so as to cause ignition of the flammable fluid, thereby creating a flame that is used by the operator to ignite the desired object.

[0005] For example, the lighter can include a roller element that is frictionally moved against a stationary object so as to cause a spark to be generated. The flammable fluid is most often either a flammable liquid that is stored in a compartment that is part of the lighter housing or a flammable gas that is stored in the compartment. In either instance, the exposure of the flammable fluid to the spark causes an explosive reaction to occur, namely combustion of the flammable fluid, thereby forming a flame as a by-product. The flame extends beyond the lighter housing and is used by the operator to ignite the object.

[0006] One of the disadvantages to using a conventional lighter constructed in the manner described above is that the ignition means of the lighter includes a flammable/explosive fluid, such as a gas, and therefore, the explosive nature of the fluid requires a high level of care in both the use, production, shipping, warehouse and sale of the lighter. In particular, the highly flammable nature of the gas makes the item potentially harmful to individuals, especially children who do not understand the potential dangers associated with a highly flammable material. In addition, the special handling of the flammable gas that is required during the production of the lighter increases the costs and complexity of the lighter production.

[0007] It is therefore desirable to provide a lighter device that overcomes the disadvantages of the prior art lighter devices and eliminates the need for a flammable fluid and is portable in nature.

SUMMARY

[0008] In one embodiment of the present invention, a lighter includes (1) a housing; (2) a rechargeable electric power source contained in the housing; (3) a heating element operatively connected to the power source; (4) an actuator for selectively connecting the heating element to the power source resulting in electricity being delivered to the heating element to cause heating thereof; and (5) a first feature for indicating a charge level of the power source and for indicating when the heating element is at an optimal temperature for igniting an object. The first feature can also indicate the charge level when the device is being charged.

[0009] In another embodiment, a flameless lighter for igniting an object includes (1) a housing; (2) a rechargeable battery contained in a first compartment in the housing; (3) a heating element operatively connected to the power source and contained in a second compartment in the housing that is insulated from the first compartment, the heating element having an exposed surface that is accessible yet recessed from one side wall of the housing to permit sufficient proximity between the object and heating element for combustion thereof; (4) an actuator for selectively connecting the heating element to the power source resulting in electricity being delivered to the heating element to cause heating thereof; and (5) wherein activation of the actuator causes electricity to be delivered to the heating element until the heating element reaches an optimal temperature at which time an auto shut-off feature of the heating element causes an interruption in the electricity being delivered to the heating element, thereby resulting in a cooling of the heating element.

[0010] Additional functional features, such as a super bright LED flashlight, and recessed lighting area can be incorporated into the design.

BRIEF DESCRIPTION OF DRAWINGS

[0011] The foregoing and other features of one embodiment of the present invention will be more readily apparent from the following detailed description and drawings of illustrative embodiments of the invention wherein like reference numbers refer to similar elements throughout the several views and in which:

[0012] FIG. **1** is a front and side perspective view of a lighter according to one embodiment of the present invention;

[0013] FIG. **2** is a rear and side perspective view of the lighter of FIG. **1**;

[0014] FIG. **3** is a bottom plan view of the lighter;

[0015] FIG. **4** is a cross-sectional view of the lighter of FIG. **1**;

[0016] FIG. **5** is a schematic for an exemplary electronic circuit used in the lighter of FIG. **1**;

[0017] FIG. **6** is an exploded perspective view of a lighter according to a second embodiment with a charging base;

[0018] FIG. **7** is a side view, in partial cross-section, of the lighter of FIG. **6**;

[0019] FIG. **8** is an exploded perspective view of a lighter according to a third embodiment with a charging base in a first position; and

[0020] FIG. **9** is a perspective view of the lighter engaged with the charging base and positioned in a second position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] A lighter device **100** according to one exemplary embodiment is illustrated in FIGS. **1-5**. The lighter device **100** is constructed and configured to be portable in nature in that it can easily be placed into a pocket, a bag, etc., of an operator. The lighter device **100** includes a housing **110** that contains the various electronic and mechanical components of the present invention and can be formed of one or more parts that are coupled to one another. The housing **110** can be formed of any number of different materials, such as a metal or plastic or a combination thereof; however, the housing **110** is typically formed of a plastic material.

[0022] The housing **110** can have any number of different shapes and can include aesthetically pleasing features. The illustrated housing **110** is generally square or rectangular in shape and is defined by a front wall or face **112**; an opposing rear wall or face **114**; a first side wall **116** that extends between the front and rear walls **112**, **114**; an opposing second side wall **118** that extends between the front and rear walls **112**, **114**, a top wall or face **120**; and an opposing bottom wall or face **122**. Preferably, the front and rear walls **112**, **114** are substantially smooth since these are the surfaces that are most often grasped by the operator. In contrast, the first and second side walls **116**, **118** include the interactive and display components of the lighter **100**, such as buttons and indicators as described below. The housing **110** is a hollow part in that the walls **112**, **114**, **116**, **118**, **120**, **122** define an interior (inner) compartment **124** that contains the inner working components of the lighter **100**.

[0023] FIGS. **4** and **5** illustrate the internal working components of the lighter **100**. In particular, the lighter **100** includes a power source **130** and a heating element **140** that is operatively connected to the power source **130**, as well as an actuator **150**, such as an on-off button or the like, for selectively activating the power source **130** for powering the heating element **140**.

[0024] According to one embodiment of the present invention, the power source **130** is a battery power source and more particularly, the power source **130** is a rechargeable battery pack or a rechargeable capacitor that is securely held within the housing **110**. Typically, the power source **130** will be the largest inner component of the lighter **100** and therefore, the power source **130** occupies a significant area of the inner compartment **124**. The power source **130** can be any number of different types of rechargeable batteries, such as a lithium ion battery or a nickel metal hydride battery, etc.

[0025] In accordance with one embodiment of the present invention, the heating element **140** is of a flameless type as opposed to conventional lighters where a small explosion occurs and a flame is generated for controlled ignition of an object. The heating element **140** is constructed so that it is powered by the power source **130**. In other words, operation of the power source **130** causes an electric current to be delivered to the heating element **140** which in turn heats up to an elevated temperature which is sufficient to ignite an object that is placed in contact thereof.

[0026] The heating element **140** is in the form of a small module that has a first end **142** and an opposing second end **144**, with the first end **142** being the end that is accessible along the front wall **112**. The first end **142** is thus constructed so that the object can be placed in sufficient proximity therewith and typically is in the form of an exposed heating surface **145** along the front wall **112**. The second end **144** of the heating element **140** is connected to the power source **130** and in particular, the second end **144** is operatively connected to the power source **130** via an electrical conduit **147**, such as a power cord, that is connected to a PCB **149**.

[0027] The heating element **140** is preferably contained in one section (compartment) of the housing **110** that opens out to the front wall **112**. Any number of different heating elements **140** can be used so long as the heating element **140** operates in a flameless manner and in particular, the heating element **140** can be either in the form of a wire coil that heats up when an electric current is passed therethrough, or the heating element **140** can be in the form of a ceramic element that heats up when an electric current is passed therethrough. One exemplary heating element **140** is a heating element that is formed of Nichrome and preferably, a reflector (not shown) is disposed behind the heating element **140** to focus the heat. The length of the heating filament **140** and the current supplied to it is tuned in order to provide the best battery life/number of lights ratio. Additionally, the heating element **140** can be supplied with a grill (not shown) to hold the object, such as a cigarette tip, fractionally away from the heating filament **140** in order to avoid the object (e.g., tobacco) from getting stuck and continuing to burn and smoke after the object (cigarette) is lit.

[0028] Preferably, the heating element **140** can be isolated from the other parts of the inner compartment **124** by using a barrier or the like. For example, an insulator **190**, such as insulation, can surround the heating element **140** so as to separate the heating element **140** from the rest of the working components, including the power source **130**. The insulator **190** protects the rest of the lighter **100** from the heat generated by the actuation of the heating element **140**.

[0029] The power source **130** can be of a rechargeable type and a charger input module **160** is provided and disposed within the interior compartment proximate the bottom wall **122**. As shown in the Figures, the charger input module **160** preferably is at least partially accessible along the bottom wall **122** of the lighter to permit the operator to operatively connect an external member to the charger input module **160** to enable recharging of the power source **130**. For example, the charger input module **160** can include one or more male or female ports or sockets **170** which are complementary to and configured to mate with a charging device **180** to permit charging of the power source **130**. Preferably, there is a plurality of mating features **170** to permit any number of different charging devices to be connected to the lighter **100**.

[0030] For example, in the illustrated embodiment of FIG. **3**, the input module **160** includes a plurality of female

sockets **170** that enable recharging with different charging devices that each has a complementary male pin that plugs into one female socket **170** at one end and into a electric outlet at the other end to supply electricity to the power source **130** for recharging thereof. Advantageously, the charging devices can be some of the most popular cellular phone chargers, such as chargers that are commercially available from Nokia, Motorola, Samsung, LG Electronics, SonyEricsson, etc. In this way, the operator of the lighter can simply use the cellular phone charger that he or she likely has since the inclusion of five female sockets **170** from the above companies presently covers approximately 80% of the cellular phone market. In other words, to charge the power source **130**, the operator simply gets his or her cellular phone charging device and plugs it into the complementary female socket **170**. The other end of the charger is either inserted into a conventional household electric outlet or into a power source outlet that is provided in some vehicles or other equipment, etc. It will be appreciated that as market trends change in the cellular phone industry, the types of sockets **170** can be changed by simply adding a new socket **170** to the module **160**.

[**0031**] The lighter **100** can include a number of features that provide a number of advancements over prior art lighters. In particular, the lighter **100** can include a level indicator, generally indicated at **180**, that performs a number of functions including visually indicating the time when the object is to be lighted, the battery level after lighting and the charge level while charging the battery. In the illustrated embodiment, the level indicator **180** is in the form of a plurality of visual indicators **182**. More specifically, the level indicators **182** can be a plurality of LEDs that are provided along one of the walls of the housing **110** and in the illustrated embodiment, the LEDs **182** are formed along the front wall **112** below the heating element **140**. The operation of the LEDs **182** is described below in detail. It will also be appreciated that instead of using an LED based display, such as the LEDs **182**, the indicator can be in the form of an LCD display for any of the embodiments disclosed herein.

[**0032**] In the illustrated embodiment, the actuator **150** includes a safety feature and is formed of a first power button **152** and an adjacent second power button **154**. Both of the buttons **152**, **154** are formed along the front wall **112** between the recessed heating element **140** and the LEDs **182**. The first power button **152**, which can be slightly smaller in size than the second power button **154**, acts as a safety switch. Pressing the first power button **152** causes the lowest indicator LED **182** to illuminate, thereby indicating that the device **100** is now in an active "awake" mode and ready to be activated. If the second power button **154** is then pressed within a predetermined time period, e.g., 5 seconds, of pressing the first power button **152**, then the heating filament **140** is heated. If the second power button **154** is not pressed within this predetermined time period, then the device **100** shuts off and goes back to a "sleep" mode.

[**0033**] In yet another embodiment, the safety mode is in the form of a lock code that is built into and stored in the master controller (PCB) and can be preferably changed. When the device includes a safety lock code, the user must press the right combination of buttons **152**, **154** in order for the device **100** to operate. For example, button **152** can be assigned the value of "1" and button **154** can be assigned the value of "2" and thus any number of different codes can be generated using a combination of these values, such as 1-1-1 or 1-2-1 or 2-2-1 or 2-2-2 or 1-2-2, etc. In order for the device **100** to operate, the user must enter the right code by pressing the right combination of buttons **152**, **154**. The device **100** can initially come with a default setting, such as 1-1-1, and then the user can set his or her own personal use code by instructive the PCB that the code is to be changed, e.g., by holding both buttons done until an audio tone is hear or a visual indicator is seen and then entering the new code using the buttons **152**, **154**. The use of a security safety code prevents a child or some other unauthorized person from pressing the two buttons **152**, **154** in the correct order to cause ignition of the heating element.

[**0034**] The number of LEDs **182** that are illuminated directly indicates to the operator the relative strength of the heating element **140** and in particular, the LEDs **182** indicate when the heating element **140** is fully energized, as well as when the device **100** is ready to be used (e.g., when the device **100** is at full heat). In the illustrated embodiment, there are five (5) LEDs **182** that indicate the relative status of the heating element **140** and the time at which the object can be lighted by being placed into contact with the heating element **140** and the charge of the battery. The more LEDs **182** that are illuminated indicates that the heating element **140** is at a higher temperature and when all of the LEDs **182** are illuminated, the heating element **140** is ready for use (fully energized) and the object is then placed into contact with the heating element **140** for ignition thereof.

[**0035**] In other words, when the first and second buttons **152**, **154** are pressed in succession and within the predetermined time period, the lighter **100** will begin to operate in start-up (active) mode in that the power source **130** supplies electricity to the heating element **140** causing heating thereof. As the heating element **140** is being heated, the level indicators **182** sequentially light up one after the other from bottom to top to indicate the heating element is heating and is closer to being of sufficient temperature to be used. Thus, in the instance, when there are five LEDs **182**, the LEDs light one at a time until all five LEDs **182** are illuminated, thus indicating that the heating element **140** is at full temperature and is ready for use. This entire process only takes a few seconds. In other words, full temperature is reached and all the LEDs **182** are illuminated in about 2 seconds or so.

[**0036**] Once the heating element **140** reaches full temperature (full power), the device **100** continues to heat the heating element (filament) **140** until either the user lets go of the second power button **154** or once a predetermined time period, such as 10 seconds, is up, whichever comes first. In this manner, the device **100** has an auto safety feature in that the lighter **100** will automatically shut off even if the second power button **154** is held down once it goes through its operating cycle. At this point the heating element **140** begins to power down and cool. Thus, when all five LEDs **182** are lit, the heating element **140** is at its highest temperature and after reaching this temperature, power (electric current) to the heating element **140** is stopped and the heating element **140** begins to cool off.

[**0037**] As the heating element **140** begins to cool, the controller **149**, such as a CPU/PCB, of the lighter **100** can be configured so that the LEDs **182** sequentially shut off to show the cooling of the heating element **140**. In other words,

the LEDs **182** count down from top to bottom to show that the heating element **140** is cooling off and once all of the LEDs **182** are dark and not illuminated, the user may place the lighter **100** back into a storage location, such as a pocket or purse or bag.

[**0038**] The power level indicator **180** also serves another purpose in that it readily permits the user to judge and ascertain the charge strength of the power source **130**, e.g., the relative strength of the battery charge. The controller of the lighter **100** is preferably configured such that when the device **100** is in cool-down mode after current is no longer being delivered to the heating element **140**, the 5 LEDs will flash for a predetermined time period, such as 5 seconds, to indicate how much charge is left in the battery **130**. Depending upon how many LEDs **182** blink, the user can judge the remaining strength of the power source **130**. For example, if three out of five LEDs **182** blink, then this indicates that approximately 60% of the charge is left in the power source **130** (battery). The greater number of LEDs **182** that blink indicates a greater charge left in the power source **130** and when only one LED **182** blinks, the operator should seek and take the necessary action to charge the power source **130**. Of course and as previously mentioned, the operator can simply charge the lighter **100** using conventional charging means, such as cellular phone chargers, and therefore, does not have to wait for the power source **130** to almost have no charge before initiating the charging process.

[**0039**] It will also be understood that the lighter **100** can be configured so that an additional visual and/or audio indicator is provided for alerting the user that the heating element **140** has reached its full operating temperature and the object should be placed in contact therewith for ignition thereof. For example, the controller of the lighter **100** can be configured so that once all the LEDs **182** are illuminated, after turning on sequentially, the LEDs **182** can then rapidly blink one or more times to indicate that the heating element **140** has reached its full operating temperature. In another embodiment, an audio alert, such as one or more beeps, can be provided to alert the user to the fact that the heating element **140** has reached its full temperature. The audio alert can be used in combination with the visual alert that is provided by the LEDs **182**.

[**0040**] The LEDs **182** serve another purpose in that they indicate the charge level as the device **100** is being charged using conventional means, such as those described above. For example, when the device **100** is plugged into a cellular phone charger, the LEDs **182** flash to indicate the charge level. Similar to the above discussion, if three LEDs **182** flash, the battery **130** has been charged to approximately 60% of full power. When the device **100** is fully charged, all five LEDs **182** are illuminated until the device **100** is disconnected from the charger.

[**0041**] In addition and as is visible in the Figures, the heating element **140** is recessed in that the first end **142** of the heating element **140** is recessed relative to the outer surface of the front wall **112**. This provides a safety advantage since the heating element **140** is not a protruding element, as is the case with a flame that can be accidentally touched by the user, thereby causing potential injury and harm. If the user accidentally touches a surface, including human skin, etc., in a location near the heating element **140**, the shell of the housing **110** around the second end **144** of the heating element **140** should contact the user's skin as opposed to the skin the user. In this way, the hot surface of the heating element **140** is kept away from the user's skin, etc. In addition, the recessed nature of the heating element **140** also prevents this element from accidentally touching another object, such as clothing, fabric, etc., which could accidentally lead to a fire being caused, etc.

[**0042**] In accordance with another aspect of the present invention, the lighter **100** can have one or more retractable jacks that can be part of the input module **160** disposed along the bottom wall **122**. In contrast to the female sockets **170** of the module **160** shown in FIGS. **3-4**, the retractable jacks are used so that the unit (lighter **100**) can be used to recharge cellular phones and other electronic equipment via the internal power source **130**. In other words, the power source **130** is an auxiliary power source for the external device, such as a cellular phone, etc. In this mode, the power source **130** of the lighter **100** is merely providing a backup emergency charging source and is not intended to supplement the normal charging procedures that are recommended for charging the external devices since the power source **130** only has a limited charge and it not intended to be provide sustained charging to the external device for hours, etc.

[**0043**] In the case when the lighter **100** includes only one retractable male jack, the lighter **100** is marketed and associated with one particular brand of external device, e.g., a Nokia cellular phone, since the male jack is provided to mate with a complementary and specific female socket that is part of the external device. A consumer can therefore purchase the lighter **100** based on the type of cellular phone that he or she carries and uses since the male jack will be specific to such cellular phone. The male jack can be operatively provided in a specific compartment of the housing **110** and is operatively coupled to the power source **130** yet is retractable in that the user can simply pull on the male jack (e.g., provided at end of a power cord, etc.) which causes the power cord and the male jack to extend from the housing **110** to permit it to be mated with the external device. When the user wants to retract the male jack, the user simply detaches the male jack from the female socket of the external unit and then feeds the power cord back through an opening formed in the housing **110** and into the inner compartment in the housing **110** that stores the retracted cord. The opening in the housing **110** that receives the cord is sized so that the male jack has greater dimensions and therefore can not fit through this opening. In this way, once the male jack contacts the housing **110**, the power cord is fully retracted into the inner compartment. In order to permit the user to grasp and pull the male jack from the housing **110**, the male jack likely protrudes slightly from the outer surface of the housing **110**.

[**0044**] In addition, it will be appreciated that a male jack can be formed by providing and inserting a male/male connector into a female socket **170**. The double male connector (male/male) is thus inserted at one end into the female socket **170**, while the other end is inserted into a female receptor of a charging device.

[**0045**] In another embodiment, a plurality of retractable male jacks is provided and offers a "universal" auxiliary power source. In this embodiment, the housing **110** is slightly enlarged to make room for a storage compartment for the power cords that are associated with the male jacks

when the male jacks are separate jacks that are separately stored in the housing **110**. Alternatively, the male jacks can be provided as loose accessories from which the user can select the appropriate male jack and store it inside a compartment inside the lighter **100**. The user would thus select the appropriate male jack and then plug it or otherwise place it on the end of the power cord that leads to the power source **130**. In this manner, the end of the power cord has a connector or the like which is complementary to the male jack such that the male jack is inserted into the connector portion of the power cord. If the user desires to connect the power source **130** to another external device, the user simply changes the male jack. When it is desirable to store the male jacks in the housing **110** itself, the housing **110** can be constructed to include an openable/closeable door or the like which leads to a small interior compartment that stores the male jacks. This design provides a more universal configuration since it permits the same lighter **100** to be used with a number of different external devices as an auxiliary charger.

[**0046**] In yet another aspect, the lighter **100** can include an illumination means **200** which provides and emits a beam of light from the housing **110**. In particular, an LED type flashlight or the like **200** can be provided along one of the walls of the lighter **100**. In the illustrated embodiment, the LED flashlight **200** is provided along the rear wall **114** opposite the front wall **112** that contains the LEDs **182**. The LED flashlight **200** is in the form of an LED (super bright LED) that is operatively coupled, as by a wire, to the power source **130** and can be actuated in any number of traditional ways, such as depressing a dome shaped cover hat overlies the LED bulb. In this manner, the user can simply press a convex dome which causes electrical contacts to close and this results in a circuit being closed and the illumination of the LED. To turn off the LED flashlight **200**, the user simply presses the dome shaped cover which causes the electrical contacts to separate and break the circuit, thereby causing the LED **200** to shut off.

[**0047**] It will be understood that any number of other conventional actuators, including an on/off button or switch, such as button **210** illustrated in FIGS. **1-4**, can be used to turn the LED flashlight **200** on and off. In one embodiment, the button **210** is a digital button spaced from the LED **200** and therefore, the user simply slightly touches the button **210** to cause the LED **200** to illuminate and stay illuminated until the user again touches the button **210** to cause the LED **200** to shut off.

[**0048**] In yet another alternative embodiment, the LED light **200** or even the button **210** can signal that the heating element **140** is at full temperature as opposed to indicating this by means of the LEDs **182**. More specifically, after the actuator **150** is activated, as by pressing the buttons **152**, **154**, and the heating element **140** reaches full temperature, the controller of the lighter **100** sends a signal to the LED light **200** causing it to illuminate. The LED light **200** illuminates for a short period of time to indicate that the heating element **140** is of sufficient temperature for igniting the object. As soon as the heating element **140** is deactivated and begins to cool and reaches a predetermined temperature, the LED light **200** is shut off and the heating element **140** continues to cool.

[**0049**] As shown in FIGS. **1-2**, the housing **110** can have a number of air intake features **220** formed in the area of the heating element **140** so as permit air to enter into the recessed area of the heating element **140** to provide a good environment for combustion of the object. It will be appreciated that the air intake elements **220** can be disposed in the same location as the insulator **190** (insulation) to permit any heat passing through the insulator **190** to flow out of the air intake elements **220**. In the illustrated embodiment, the housing **110** is slightly flared out to form an arcuate rounded section at the location where the heating element **140** is located so as to accommodate the heating element **140** within the housing **110**. In particular, the heating element **140** often has a round structure and therefore, the rounded section of the housing **110** permits reception and is complementary to the heating element **140**.

[**0050**] The present invention provides an alternative type of lighter that offers a number of safety improvements and features over the prior art since the present invention has a child proof heating element and does not include dangerous flammable fluids, such as explosive gases and flammable liquids. The lighter **100** is more child safe since it is of a flameless design and does not use a flame to ignite an object. Instead, the flameless heating element is used to ignite an object, e.g., a cigarette, using the electrically powered heating element **140**.

[**0051**] It will therefore be appreciated that the housing **110** preferably has an aesthetically pleasing shape that is defined by smooth flowing lines and a shape that easily can be grasped and held by the user.

[**0052**] FIG. **5** illustrates an exemplary circuit diagram for the device **100**. It will be appreciated that the circuit is configured to provide for the above functionality and features.

[**0053**] A lighter device **300** according to one exemplary embodiment is illustrated in FIGS. **6-7**. The lighter device **300** is similar to the lighter device **100** and is constructed and configured to be portable in nature in that it can easily be placed into a pocket, a bag, etc., of an operator. The lighter device **300** includes a housing **310** that contains the various electronic and mechanical components of the present invention and can be formed of one or more parts that are coupled to one another. The housing **310** can be formed of any number of different materials, such as a metal or plastic or a combination thereof; however, the housing **310** is typically formed of a plastic material.

[**0054**] The housing **310** can have any number of different shapes and can include aesthetically pleasing features. The illustrated housing **310** is generally cylindrical or oval in shape and is defined by an upper beveled face **312**, an opposite bottom face **314** and a side wall **320** that extends between the faces **312**, **314**. The side wall **320** is preferably substantially smooth since this is the surface that is most often grasped by the operator during use of the lighter **300**. The housing **310** is a hollow part in that the faces **312**, **314** and side wall **320** define an interior (inner) compartment that contains the inner working components of the lighter **300**.

[**0055**] The internal working components of the lighter **300** are similar to the working components of the lighter **100**. In particular, the lighter **300** includes a power source, e.g., similar to power supply **130**, and a heating element **330** that is operatively connected to the power source, as well as an actuator **340**, such as an on-off button or the like, for selectively activating the power source for powering the heating element **330**.

[0056] According to the present invention, the power source is a battery power source and more particularly, the power source is a rechargeable battery pack that is securely held within the housing **310**. Typically, the power source will be the largest inner component of the lighter **300** and therefore, the power source occupies a significant area of the inner compartment. The power source can be any number of different types of rechargeable batteries, such as a lithium ion battery or a nickel metal hydride battery, etc.

[0057] In accordance with the present invention, the heating element **330** is of a flameless type as opposed to conventional lighters where a small explosion occurs and a flame is generated for controlled ignition of an object. The heating element **330** is constructed so that it is powered by the power source. In other words, operation of the power source causes an electric current to be delivered to the heating element **330** which in turn heats up to an elevated temperature which is sufficient to ignite an object that is placed in contact thereof.

[0058] The heating element **330** can be similar to the heating element **140** and can therefore be in the form of a small module that has a first end and an opposing second end, with the first end being the end that is accessible along the side wall **320**. The first end is thus constructed so that the object can be placed in sufficient proximity therewith and typically is in the form of an exposed heating surface **332** that is accessible along the side wall **320** by means of an opening **334** formed in the side wall **320**. The illustrated opening **334** has and is defined by a smooth beveled edge which assists in locating the user's finger and directing it to the heating surface **332**.

[0059] The second end of the heating element **330** is connected to the power source and in particular, the second end is operatively connected to the power source via an electrical conduit, such as a power cord.

[0060] The heating element **330** is preferably contained in one section (compartment) of the housing **310** that opens out to the side wall **320**. Any number of different heating elements **330** can be used so long as the heating element **330** operates in a flameless manner and in particular, the heating element **330** can be either in the form of a wire coil that heats up when an electric current is passed therethrough, or the heating element **330** can be in the form of a ceramic element that heats up when an electric current is passed therethrough. One exemplary heating element **330** is a heating element that is formed of Nichrome and preferably, a reflector (not shown) is disposed behind the heating element **330** to focus the heat. The length of the heating filament **330** and the current supplied to it is tuned in order to provide the best battery life/number of lights ratio. Additionally, the heating element **330** can be supplied with a grill (not shown) to hold the object, such as a cigarette tip, fractionally away from the heating filament **330** in order to avoid the object (e.g., tobacco) from getting stuck and continuing to burn and smoke after the object (cigarette) is lit.

[0061] In the illustrated embodiment, the heating surface **332** has a raised spiral pattern to alert the user to the location of the heating surface **332**.

[0062] Preferably, the heating element **330** can be isolated from the other parts of the inner compartment by using a barrier or the like. For example, an insulator, such as insulation, can surround the heating element **330** so as to separate the heating element **330** from the rest of the working components, including the power source. The insulator protects the rest of the lighter **300** from the heat generated by the actuation of the heating element **330**.

[0063] Similar to the earlier embodiment, the lighter **300** includes several other buttons formed on the side wall **320**. In particular, the side wall **320** includes the actuator **150** and in the illustrated embodiment, the actuator includes a safety feature and is formed of a first power button **342** and an adjacent second power button **344**. Both of the buttons **342**, **344** are formed along the side wall **320** and are accessible through openings **346**, **348**, respectively, defined by beveled edges like the opening **334**. The openings **334**, **346**, **348** and the heating surface **332** and buttons **342**, **344** are axially aligned along the side wall **320** and in the illustrated embodiment, the first power button **342** is located between the recessed heating surface **332** and the second button **344**. The first power button **342**, which can be the same size or a different size than the second power button **344**, acts as a safety switch.

[0064] The upper beveled face **312** includes the LEDs **182** that act as a heat/charge indicator as described in detail below. Pressing the first power button **342** causes the lowest indicator LED **182** to illuminate, thereby indicating that the device **300** is now in an active "awake" mode and ready to be activated. If the second power button **344** is then pressed within a predetermined time period, e.g., 5 seconds, of pressing the first power button **342**, then the heating filament **330** is heated. If the second power button **344** is not pressed within this predetermined time period, then the device **300** shuts off and goes back to a "sleep" mode.

[0065] The number of LEDs **182** that are illuminated directly indicates to the operator the relative strength of the heating element **330** and in particular, the LEDs **182** indicate when the heating element **330** is fully energized, as well as when the device **300** is ready to be used (e.g., when the device **300** is at full heat). In the illustrated embodiment, there are five (5) LEDs **182** that indicate the relative status of the heating element **330** and the time at which the object can be lighted by being placed into contact with the heating element **330** and the charge of the battery. The more LEDs **182** that are illuminated indicates that the heating element **330** is at a higher temperature and when all of the LEDs **182** are illuminated, the heating element **330** is ready for use (fully energized) and the object is then placed into contact with the heating element **330** for ignition thereof.

[0066] In other words, when the first and second buttons **342**, **344** are pressed in succession and within the predetermined time period, the lighter **300** will begin to operate in start-up (active) mode in that the power source supplies electricity to the heating element **330** causing heating thereof. As the heating element **330** is being heated, the level indicators **182** sequentially light up one after the other from bottom to top to indicate the heating element is heating and is closer to being of sufficient temperature to be used. Thus, in the instance, when there are five LEDs **182**, the LEDs light one at a time until all five LEDs **182** are illuminated, thus indicating that the heating element **330** is at full temperature and is ready for use. This entire process only takes a few seconds. In other words, full temperature is reached and all the LEDs **182** are illuminated in about 2 seconds or so.

[0067] Once the heating element **330** reaches full temperature (full power), the device **300** continues to heat the heating element (filament) **330** until either the user lets go of the second power button **344** or once a predetermined time period, such as **10** seconds, is up, whichever comes first. In this manner, the device **300** has an auto safety feature in that the lighter **300** will automatically shut off even if the second power button **344** is held down once it goes through its operating cycle. At this point the heating element **330** begins to power down and cool. Thus, when all five LEDs **182** are lit, the heating element **330** is at its highest temperature and after reaching this temperature, power (electric current) to the heating element **330** is stopped and the heating element **330** begins to cool off.

[0068] As the heating element **330** begins to cool, the controller, such as a CPU/PCB, of the lighter **300** can be configured so that the LEDs **182** sequentially shut off to show the cooling of the heating element **330**. In other words, the LEDs **182** count down from top to bottom to show that the heating element **330** is cooling off and once all of the LEDs **182** are dark and not illuminated, the user may place the lighter **300** back into a storage location, such as a pocket or purse or bag.

[0069] The power level indicator also serves another purpose in that it readily permits the user to judge and ascertain the charge strength of the power source, e.g., the relative strength of the battery charge. The controller of the lighter **300** is preferably configured such that when the device **300** is in cool-down mode after current is no longer being delivered to the heating element **330**, the 5 LEDs will flash for a predetermined time period, such as 5 seconds, to indicate how much charge is left in the battery. Depending upon how many LEDs **182** blink, the user can judge the remaining strength of the power source. For example, if three out of five LEDs **182** blink, then this indicates that approximately 60% of the charge is left in the power source (battery). The greater number of LEDs **182** that blink indicates a greater charge left in the power source and when only one LED **182** blinks, the operator should seek and take the necessary action to charge the power source. Of course and as previously mentioned, the operator can simply charge the lighter **300** using conventional charging means, such as cellular phone chargers, and therefore, does not have to wait for the power source to almost have no charge before initiating the charging process.

[0070] It will also be understood that the lighter **300** can be configured so that an additional visual and/or audio indicator is provided for alerting the user that the heating element **330** has reached its full operating temperature and the object should be placed in contact therewith for ignition thereof. For example, the controller of the lighter **300** can be configured so that once all the LEDs **182** are illuminated, after turning on sequentially, the LEDs **182** can then rapidly blink one or more times to indicate that the heating element **330** has reached its full operating temperature. In another embodiment, an audio alert, such as one or more beeps, can be provided to alert the user to the fact that the heating element **330** has reached its full temperature. The audio alert can be used in combination with the visual alert that is provided by the LEDs **182**.

[0071] The LEDs **182** serve another purpose in that they indicate the charge level as the device **300** is being charged using conventional means, such as those described above. For example, when the device **300** is plugged into a cellular phone charger, the LEDs **182** flash to indicate the charge level. Similar to the above discussion, if three LEDs **182** flash, the battery has been charged to approximately 60% of full power. When the device **300** is fully charged, all five LEDs **182** are illuminated until the device **300** is disconnected from the charger.

[0072] In addition and as is visible in the Figures, the heating element **330** is recessed relative to the outer surface of the side wall **320**. This provides a safety advantage since the heating element **330** is not a protruding element, as is the case with a flame that can be accidentally touched by the user, thereby causing potential injury and harm. If the user accidentally touches a surface, including human skin, etc., in a location near the heating element **330**, the shell of the housing **310** around the recessed heating element **330** should contact the user's skin as opposed to the skin the user. In this way, the hot surface of the heating element **330** is kept away from the user's skin, etc. In addition, the recessed nature of the heating element **330** also prevents this element from accidentally touching another object, such as clothing, fabric, etc., which could accidentally lead to a fire being caused, etc.

[0073] The beveled nature of the upper face **312** and the placement of the LEDs **182** thereon provide an effective means for displaying information to the user when the user holds the device **300** in his or her hand.

[0074] In yet another aspect, the device **300** includes a charging element **350** that is formed at one end of the device **300** and is configured to be releasably coupled with a charging base **360** as described below. The charging element **350** is in the form of a conductive contact or the like that is operatively connected to the power source (battery) contained in the housing **310**. In the illustrated embodiment, the charging element **350** is formed on an underside of the housing **310** and is made from a conductive material, such as a metal.

[0075] The housing **310** includes a release mechanism that includes a release button **370** that is accessible through an opening **372** along the side wall **320**. It will be appreciated that any number of mechanical based mechanisms can be used in combination and a part of the release button **360** to cause the release of the charging base **360**.

[0076] The charging element **350** itself is designed to mate with a charging base **360** which is configured to mate with a power source, such as a lighter element in a vehicle, etc. In particular, the end of the housing **310** that includes the charging element **350** is designed to be received in a cavity **361** of the charging base **360**. The charging base **360** is in the form of a DC adapter that is particularly configured to be used in a vehicle (12 V socket) or a complementary charging base. For example, the charging base **360** is configured to be plugged into a lighter socket of a vehicle. The illustrated charging base **360** includes a generally hollow shell or body **362** that has the central cavity or compartment **361** for receiving the distal end of the charging element **350**. In the illustrated embodiment, the body **362** has a larger diameter end **364** that receives the distal end of the charging element **350** and a smaller diameter end **366** that is designed to be matingly received in the vehicle lighter socket or the like.

[0077] The body **362** of the charging base **360** is similar to typical DC vehicle adapters and includes a pair of flexible

conductive prongs **365** that extend outwardly from the body **362** and a retractable distal conductive pin **367**. These conductive members (the prongs **365** and pin **367**) prove an electrical connection to a power source associated with the vehicle and thus, when the charging element **350** is plugged into the charging base **360** and the charging base **360** is itself plugged into the vehicle lighter socket, electricity can flow through the charging base **360** and charging element **350** to the power source of the lighter **300** for recharging thereof. For example, the charging base **360** can include a conductive element **351** (a ring) that mates with and engages the charging element **350** when the housing **310** is received in the charging base **360** so as to provide an electrical connection therebetween.

[**0078**] The release mechanism is designed to disengage the housing **310** from the charging base **360** when the user wants to separate the two as in the case where the device **300** is to be operated and is fully charged. For example, pressing the release button **370** can cause movement of a locking tab or pawl from a complementary locking member, such as a recess, formed as part of the charging base **360**. The release mechanism can be a biased mechanism (spring biased mechanism) where pressing the release button **370** can provide a force that overcomes the biasing force and causes the locking member, such as the tab or pawl, to disengage the complementary feature that is part of the charging base **360**.

[**0079**] As with the other buttons, the release button **30** is recessed relative to the surrounding surface of the side wall **320** and is accessible through the opening **372** formed in the side wall **320**. The release button **370**, in the illustrated embodiment, is located on the opposite side of the side wall **320** in that the release button **370** is formed about **180** degrees opposite the other buttons. The release button **370** preferably is located separate from the other buttons since the release button **370** is associated with charging of the lighter **300**, while the other buttons are concerned with the operation of the lighter **300**. Since the two operations are typically not performed concurrently, the associated buttons can be separated from one another as shown.

[**0080**] It will also be understood that instead of using a **12** V vehicle power source, the device **100** can be powered and recharged by connection to a USB port of a computer.

[**0081**] Now turning to FIGS. **8-9** in which a lighter **400** according to another embodiment is illustrated. The lighter **400** is similar to the lighters **100** and **300** and therefore, like elements will not be discussed in great detail.

[**0082**] The lighter **400** is constructed and configured to be portable in nature in that it can easily be placed into a pocket, a bag, etc., of an operator. The lighter device **400** includes a housing **410** that contains the various electronic and mechanical components of the present invention and can be formed of one or more parts that are coupled to one another. The housing **410** can be formed of any number of different materials, such as a metal or plastic or a combination thereof; however, the housing **410** is typically formed of a plastic material.

[**0083**] The housing **410** can have any number of different shapes and can include aesthetically pleasing features. The illustrated housing **410** has a generally triangular shape and is defined by a top edge **412**, a bottom edge **414**, a rear surface **416**, a front surface **418** and a pair of opposing side surfaces **420**. The side surfaces **420** are angled inward toward the front surface **418** from the rear surface **416** so as to define the triangular shape of the housing **410**. The surfaces **416**, **418**, **420** are preferably substantially smooth since these are the surface that are most often grasped by the operator during use of the lighter **400**.

[**0084**] The housing **410** also includes an angled top surface **422** that forms a part of the front surface **418** and is formed between the side surfaces **420**. The angled top surface **422** is angled downward toward the bottom edge **414** of the housing **410** so as to be easily viewable by the user when the user grips the housing **410** around the side surfaces **420**. As described below the top surface **422** includes a number of the functional and informative features of the present invention.

[**0085**] The housing **410** is a hollow part in that the surfaces **416**, **418**, **420** define an interior (inner) compartment that contains the inner working components of the lighter **400**. The internal working components of the lighter **400** are similar to the working components of the lighters **100** and **300**. In particular, the lighter **400** includes a power source and a heating element **430** that is operatively connected to the power source, as well as an actuator **440**, such as an on-off button or the like, for selectively activating the power source for powering the heating element **430**.

[**0086**] According to the present invention, the power source is a battery power source and more particularly, the power source is a rechargeable battery pack that is securely held within the housing **410**.

[**0087**] In accordance with the present invention, the heating element **430** is of a flameless type as described above in detail with reference to heating elements **140** and **330**. The heating element **430** can therefore be in the form of a small module that has a first end and an opposing second end, with the first end being the end that is accessible along the angle top surface **422**. The first end is thus constructed so that the object can be placed in sufficient proximity therewith and typically is in the form of an exposed heating surface **432** that is accessible along the top surface **422** by means of an opening **424** formed in the top surface **422**. The illustrated opening **424** has and is defined by a smooth beveled edge which assists in locating the cigarette or the like and directing it to the heating surface **332**.

[**0088**] The second end of the heating element **430** is connected to the power source and in particular, the second end is operatively connected to the power source via an electrical conduit, such as a power cord.

[**0089**] As described above, the heating element **430** can be either in the form of a wire coil that heats up when an electric current is passed therethrough, or the heating element **430** can be in the form of a ceramic element that heats up when an electric current is passed therethrough. One exemplary heating element **430** is a heating element that is formed of Nichrome and preferably, a reflector (not shown) is disposed behind the heating element **430** to focus the heat.

[**0090**] In the illustrated embodiment, the heating surface **432** has a raised spiral pattern (similar to a fingerprint) to alert the user to the location of the heating surface **432**.

[**0091**] Similar to the earlier embodiment, the lighter **400** includes several other buttons formed one side surface **420**.

In particular, the side surface **420** includes the actuator **440** and in the illustrated embodiment, the actuator **440** includes a safety feature and is formed of a rocker switch having a first section **442** at one end and a second section **444** at the other end of the switch. The rocker switch **440** is formed along one side surface **420** and are accessible through an opening **446**. In the illustrated embodiment, both the rocker switch **440** and the opening **446** have a triangular shape.

[**0092**] The top edge **412** of the housing **410** includes an information display region **452** that includes the LEDs **182** that act as a heat/charge indicator as described in detail below. Pressing the first section **442** of the rocker switch **440** causes the lowest indicator LED **182** to illuminate, thereby indicating that the device **400** is now in an active "awake" mode and ready to be activated. If the second section **444** is then pressed within a predetermined time period, e.g., 5 seconds, of pressing the first section **442**, then the heating filament **430** is heated. If the second section **444** is not pressed within this predetermined time period, then the device **400** shuts off and goes back to a "sleep" mode.

[**0093**] The number of LEDs **182** that are illuminated directly indicates to the operator the relative strength of the heating element **430** and in particular, the LEDs **182** indicate when the heating element **430** is fully energized, as well as when the device **400** is ready to be used (e.g., when the device **400** is at full heat). In the illustrated embodiment, there are five (5) LEDs **182** that indicate the relative status of the heating element **430** and the time at which the object can be lighted by being placed into contact with the heating element **430** and the charge of the battery. The more LEDs **182** that are illuminated indicates that the heating element **430** is at a higher temperature and when all of the LEDs **182** are illuminated, the heating element **330** is ready for use (fully energized) and the object is then placed into contact with the heating element **330** for ignition thereof.

[**0094**] In other words, when the first and second switch sections **442**, **444** are pressed in succession and within the predetermined time period, the lighter **400** will begin to operate in start-up (active) mode in that the power source supplies electricity to the heating element **430** causing heating thereof. As the heating element **430** is being heated, the level indicators **182** sequentially light up one after the other from bottom to top to indicate the heating element is heating and is closer to being of sufficient temperature to be used. Thus, in the instance, when there are five LEDs **182**, the LEDs light one at a time until all five LEDs **182** are illuminated, thus indicating that the heating element **430** is at full temperature and is ready for use. This entire process only takes a few seconds. In other words, full temperature is reached and all the LEDs **182** are illuminated in about 2 seconds or so.

[**0095**] Once the heating element **430** reaches full temperature (full power), the device **400** continues to heat the heating element (filament) **430** until either the user lets go of the second power button **444** or once a predetermined time period, such as 10 seconds, is up, whichever comes first. In this manner, the device **400** has an auto safety feature in that the lighter **400** will automatically shut off even if the second power button **444** is held down once it goes through its operating cycle. At this point the heating element **430** begins to power down and cool. Thus, when all five LEDs **182** are lit, the heating element **430** is at its highest temperature and after reaching this temperature, power (electric current) to the heating element **430** is stopped and the heating element **430** begins to cool off.

[**0096**] As the heating element **430** begins to cool, the controller, such as a CPU/PCB, of the lighter **400** can be configured so that the LEDs **182** sequentially shut off to show the cooling of the heating element **430**. In other words, the LEDs **182** count down from top to bottom to show that the heating element **430** is cooling off and once all of the LEDs **182** are dark and not illuminated, the user may place the lighter **400** back into a storage location, such as a pocket or purse or bag.

[**0097**] The power level indicator also serves another purpose in that it readily permits the user to judge and ascertain the charge strength of the power source, e.g., the relative strength of the battery charge. The controller of the lighter **400** is preferably configured such that when the device **400** is in cool-down mode after current is no longer being delivered to the heating element **430**, the 5 LEDs will flash for a predetermined time period, such as 5 seconds, to indicate how much charge is left in the battery. Depending upon how many LEDs **182** blink, the user can judge the remaining strength of the power source. For example, if three out of five LEDs **182** blink, then this indicates that approximately 60% of the charge is left in the power source (battery). The greater number of LEDs **182** that blink indicates a greater charge left in the power source and when only one LED **182** blinks, the operator should seek and take the necessary action to charge the power source. Of course and as previously mentioned, the operator can simply charge the lighter **400** using conventional charging means, such as cellular phone chargers, and therefore, does not have to wait for the power source to almost have no charge before initiating the charging process.

[**0098**] It will also be understood that the lighter **400** can be configured so that an additional visual and/or audio indicator is provided for alerting the user that the heating element **430** has reached its full operating temperature and the object should be placed in contact therewith for ignition thereof. For example, the controller of the lighter **400** can be configured so that once all the LEDs **182** are illuminated, after turning on sequentially, the LEDs **182** can then rapidly blink one or more times to indicate that the heating element **430** has reached its full operating temperature. In another embodiment, an audio alert, such as one or more beeps, can be provided to alert the user to the fact that the heating element **430** has reached its full temperature. The audio alert can be used in combination with the visual alert that is provided by the LEDs **182**.

[**0099**] The LEDs **182** serve another purpose in that they indicate the charge level as the device **400** is being charged using conventional means, such as those described above. For example, when the device **400** is plugged into a cellular phone charger, the LEDs **182** flash to indicate the charge level. Similar to the above discussion, if three LEDs **182** flash, the battery has been charged to approximately 60% of full power. When the device **400** is fully charged, all five LEDs **182** are illuminated until the device **400** is disconnected from the charger.

[**0100**] In yet another aspect, the device **400** includes a charging element, that can be similar to the element **350**, and can be in the form of a conductive contact that is located at the bottom surface of the device **400**. The charging element itself is designed to mate with a pivotable charging base **470** which is configured to mate with a power source, such as a

lighter element in a vehicle, etc. The charging element can include one or more flexible conductive prongs (e.g., metal prongs or conductive pad) that are biased outwardly but can easily be depressed when a force is applied thereto. The conductive prongs or the conductive pad that is provided on the bottom surface serve as one or more electrical contacts that are connected to the power source of the lighter **400** so that electricity can flow through the conductive contacts along a conductor, such as a wire, and to the power source for the recharging thereof.

[**0101**] The charging base **470** is in the form of a DC adapter that is particularly configured to be used in a vehicle (12 V socket) or a complementary charging base. For example, the charging base **470** is configured to be plugged into a lighter socket of a vehicle. The illustrated charging base **470** includes a generally hollow shell or body that is in the form of charging block **480** that is pivotable connected to a base portion **490**. The charging block **480** includes an opening or cavity **482** for receiving the bottom of the lighter **400** so that the charging element is received therein. The charging block **480** is generally in the shape of a cube and includes opposing side walls **484** that are pivotally attached to the base portion **490**.

[**0102**] The base portion **490** includes a first section that is generally U-shaped and includes a pair of opposing side arms **492** that are spaced from one another. The charging block **480** is disposed between the side arms **492** and is pivotally attached to the side arms **492**.

[**0103**] The charging block **480** is pivotally connected to the base portion **490** and in particular the side arms **492** thereof such that the charging block **480** is pivotable relative to the side arms **492** that that the lighter **400** received in the charging block **480** can be positioned perpendicular to the longitudinal axis of the base portion **490** (side arms **492**) as shown in FIG. **9** or the charging block **480** can be positioned in the same plane and along the longitudinal axis of the base portion **490** (side arms **492**) as shown in FIG. **8**. The flexibility permits the lighter **400** to be positioned in any number of different positions that accommodate the surrounding environment in the vehicle and the preferences of the user. For example, some users might like the lighter **400** to be positioned vertically (at a 90 degree relative to the base portion **490** as in FIG. **9**), while other users might prefer the lighter **400** to be extend horizontally within the vehicle as in FIG. **8**.

[**0104**] The charging base **470** is in the form of a DC adapter that is particularly configured to be used in a vehicle (12 V socket) or a complementary charging base. For example, the charging base **470** is configured to be plugged into a lighter socket of a vehicle.

[**0105**] The body **472** of the charging base **470** is similar to typical DC vehicle adapters and includes a pair of flexible conductive prongs **474** that extend outwardly from the body **472** and a retractable distal conductive pin **476**. These conductive members (the prongs **474** and pin **476**) prove an electrical connection to a power source associated with the vehicle and thus, when the charging element is plugged into the charging block **480**, an electrical connection is formed with the conductive element in the body **472**, in particular, the prongs **474** and pin **476**, is itself plugged into the vehicle lighter socket, electricity can flow through the charging base **470** and charging element to the power source of the lighter **400** for recharging thereof.

[**0106**] In yet another embodiment, the lighter itself, such as lighter **300** or lighter **400** can be constructed for insertion directly into the power source, such as a 12 V vehicle power source. In other words, the elements (conductive prongs) of the respective charging base are directly incorporated into the base of the lighter to permit the lighter to be directly inserted into the power/charging source.

[**0107**] All references, publications, pending and issued patents are herein each incorporated by reference in their entirety.

[**0108**] Thus, while there have been shown, described, and pointed out fundamental novel features of the invention as applied to a preferred embodiment thereof, it will be understood that various omissions, substitutions, and changes in the form and details of the devices illustrated, and in their operation, may be made by those skilled in the art without departing from the spirit and scope of the invention. For example, it is expressly intended that all combinations of those elements and/or steps which perform substantially the same function, in substantially the same way, to achieve the same results are within the scope of the invention. Substitutions of elements from one described embodiment to another are also fully intended and contemplated. It is also to be understood that the drawings are not necessarily drawn to scale, but that they are merely conceptual in nature. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.

What is claimed is:

1. A lighter comprising:

a housing;

a rechargeable battery contained in the housing;

a heating element operatively connected to the battery; and

an actuator that selectively connects the heating element to the battery resulting in electric current being delivered to the heating element to cause heating thereof.

2. A lighter comprising:

a housing;

a rechargeable electric power source contained in the housing;

a heating element operatively connected to the power source;

an actuator that selectively connects the heating element to the power source resulting in electric current being delivered to the heating element to cause heating thereof; and

an indicator that selectively indicates a charge level of the power source and selectively indicates when the heating element is at an optimal temperature for igniting an object.

3. The lighter of claim 2, wherein the rechargeable power source comprises a rechargeable battery.

4. The lighter of claim 2, wherein the housing comprises a hollow structure that includes a first compartment for the rechargeable electric power source and a second compartment that contains the heating element.

5. The lighter of claim 2, wherein the heating element is recessed relative to a wall of the housing such that an exposed portion of the heating element is recessed relative to the wall.

6. The lighter of claim 5, wherein the heating element is surrounded by insulation so as to thermally insulate the heating element and other portions of the housing.

7. The lighter of claim 2, wherein the heating element has an auto shut-off feature such that after actuating the actuator and after the heating element reaches its optimal temperature, the heating element automatically shuts off by preventing flow of the electric current to the heating element, thereby resulting in cooling of the heating element.

8. The lighter of claim 2, wherein the indicator comprises a power level indicator in the form of a plurality of LEDs and a controller, wherein the number of LEDs that are illuminated corresponds to a level of charge left in the power source after the heating element is fully energized, the controller being configured such that the more LEDs that are illuminated represents a greater charge left in the power source.

9. The lighter of claim 8, wherein the plurality of LEDs comprises more than 4 LEDs with each LED representing that 1/x charge remains in the power source with x being the number of LEDs.

10. The lighter of claim 8, wherein after the heating element shuts off and the lighter is in a power down mode, one or more LEDs blink simultaneously to indicate a relative strength of the power source, wherein a greater number of LEDs that blink indicate a greater stored charge of the power source.

11. The lighter of claim 2, further including:

one or more female sockets that are operatively coupled to the power source, with each socket being configured to receive a charging element that is operatively connected to a source of electricity for recharging of the power source.

12. The lighter of claim 11, wherein the one or more female sockets are disposed along one wall of the housing and are accessible by a user, with each female socket being associated with a different charging element for recharging of the power source.

13. The lighter of claim 12, wherein the charging element comprises a cellular phone charger.

14. The lighter of claim 2, wherein the indicator comprises a plurality of LEDs that illuminate successively to indicate an increasing temperature of the heating element.

15. The lighter of claim 14, wherein illumination of all of the LEDs indicates that the heating element is at the optimal temperature and is fully energized.

16. The lighter of claim 2, wherein the heating element comprises one of a wire coil and a ceramic heating element.

17. The lighter of claim 2, further including:

one or more retractable or insertable jacks that are each operatively connected to the power source to permit the lighter to act as an auxiliary power source when an external object is connected to the jack and electricity is drawn from the power source of the lighter for recharging of the external object.

18. The lighter of claim 17, wherein each retractable jack is a double male jack that includes a first connector and optionally a power cord connected to the power source, the external object having a second connector that is complementary to the first connector to permit electric current to be drawn from the power source to the external device.

19. The lighter of claim 2, wherein the indicator comprises an LCD display.

20. The lighter of claim 2, wherein the actuator includes a first power button and a second safety button, the actuator selectively connecting the heating element to the power source when the second button is pressed within a predetermined time period after the first button has been pressed.

21. The lighter of claim 2, wherein the actuator includes a first power button having a first value and a second safety button and a second value, the actuator selectively connecting the heating element to the power source when a security code represented by a combination of first and second values is entered using the first and second buttons.

22. The lighter of claim 2, wherein an outer shell of the housing includes conductive elements connected to the power source and adapted to be inserted into an external power source to electrically connected the external power source to the rechargeable power source for recharging thereof.

23. A flameless lighter for igniting an object comprising:

a housing;

a rechargeable power source contained in a first compartment in the housing;

a heating element operatively connected to the power source and contained in a second compartment in the housing that is insulated from the first compartment, the heating element having an exposed surface that is accessible along a surface of the housing to permit contact between the object and heating element for combustion thereof;

an actuator that selectively connects the heating element to the power source resulting in electric current being delivered to the heating element to cause heating thereof;

a charging element that is part of the housing and is operatively connected to the power source and is accessible for insertion into a complementary charging base for releasably locking the housing to the charging base; and

a release mechanism including a button that is part of the housing for disengaging the housing from the charging base;

wherein activation of the actuator causes electricity to be delivered to the heating element until the heating element is fully energized at which time an auto shut-off feature of the heating element causes an interruption in the electricity being delivered to the heating element, thereby resulting in a cooling of the heating element.

24. The lighter of claim 23, further including:

a visual indicator for indicating a current charge level of the power source after ignition of the heating element and for indicating when the heating element is fully energized, wherein a display of the current charge level is visually different from a display of when the heating element is fully energized.

25. The lighter of claim 24, wherein the heating element is exposed by an opening formed in a side wall of the housing and the visual indicator is formed in a surface that is angled relative to the side wall.

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