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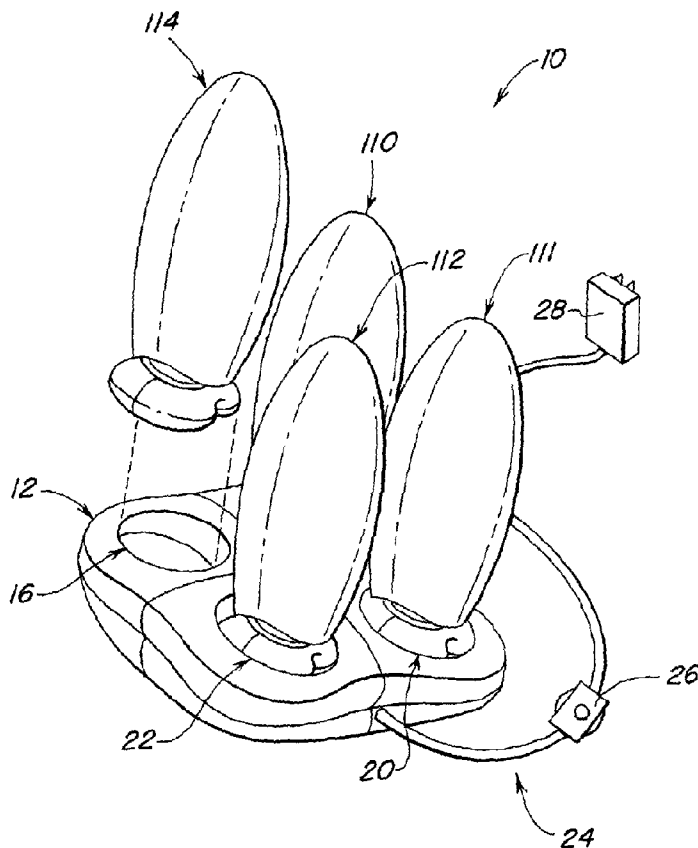
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(54) Title: RECHARGEABLE LAMP SYSTEM



(57) Abstract: A rechargeable lamp system (10) includes a set of one or more self-standing rechargeable lighting fixtures (12) removably received on a recharging platter. The luminaires each include a light diffuser (114) resembling a candle that turns on when removed from the charging platter (28). The luminaires also turn on when power to the charging platter (28) is turned off, which allows the set to be used as a table lamp, and has the added benefit of turning the luminaires on automatically during a power failure. The luminaires are each inductively coupled to the recharging platter, which enables to provide an aesthetically pleasing interface free of electrical contacts.



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## RECHARGEABLE LAMP SYSTEM

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### FIELD OF THE INVENTION

The present invention is drawn to the field of illumination, and more particularly, to a novel rechargeable lamp system.

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### BACKGROUND OF THE INVENTION

Candles may be moved and placed to provide illumination and/or ambience. While their utilitarian and aesthetic advantages are well-known, candles suffer from an undesirable self-consumption, needing to be replaced when used-up; produce smoke especially when snuffed, which may foul the air; require vigilant attendance to mitigate an ever-present fire hazard; are susceptible to being extinguished by gusts of air when used outdoors or moved around; and may give rise to undesirable wax build-up, which in many instances needs removed from candle support members or underlying structures.

There is thus a need to provide a rechargeable lamp system that enjoys the many utilitarian and aesthetic advantages of candles but is not subject to their disadvantages.

SUMMARY OF THE INVENTION

It is accordingly a general object of the present invention to disclose a rechargeable lamp system that provides candle-like lighting for indoor or outdoor use that avoids the problems associated with candles.

In one broad form the invention comprises an autoilluminating rechargeable lamp system providing soft, candle-like ambient lighting about indoor and outdoor locations, comprising:

a portable charging stand removably supporting a set of luminaries removably supported on the portable charging stand, wherein the portable charging stand and set of luminarie supported on the portable charging stand are freely movable to any indoor and outdoor location, allowing the charging stand to be moved to any indoor and outdoor location and allowing each luminary of the set of luminaries removably supported on the charging stand to be individually removed and placed in the environment of that location;

said portable charging stand removably supporting said set of luminaries including a charge circuit providing a charge signal to each luminary of said set of luminaries supported by said stand;

each said luminary of said set of luminaries is self standing on and freely removable from the charging stand and provides the illumination and ambience of candles without suffering their undesirable disadvantages of self-consumption, smoke, unintended extinguishment and wax buildup, each said luminary of said set of luminaries including an electric lamp of illumination corresponding to that of a candle, a rechargeable battery pack connected to said lamp and a housing in which the lamp and rechargeable battery pack are mounted, wherein said housing in which the lamp is mounted includes a diffuser having a size and shape resembling a hand holdable candle, and wherein said diffuser having a size and shape resembling a hand holdable candle has a translucence of such transmission and diffusion

as to simulate the soft ambience of a glowing candle when the lamp within the housing is lit; and

Autoilluminating means coupled to each luminary of said set of luminaries and responsive to said charge signal for lighting said lamp of each luminary in response to non-detection of said charge signal, and for de-lighting said lamp of each luminary in response to detection of said charge signal, whereby, each said luminary of said set of luminaries lights if removed from said portable charging stand and de-lights if supported thereby

In an alternate broad form the invention also comprises an autoilluminating lamp system providing soft, candle-like ambient lighting about indoor and outdoor locations, comprising:

a portable stand removably supporting a set of luminaries removably supported on the portable stand, wherein the portable stand and set of luminaries supported on the portable stand are movable to any indoor and outdoor location, allowing the charging stand to be moved to any indoor and outdoor location and allowing each luminary of the set of luminaries removably supported on the portable stand to be individually removed and placed in the environment of that location;

said portable stand is adapted to removably support at least one luminary receivable on and removable from said portable stand;

each said luminary of said set of luminaries is self standing on and freely removable from the charging stand and provides the illumination and ambience of candles without suffering their undesirable disadvantages of self-consumption, smoke, unintended extinguishment and wax buildup, each said luminary of said set of luminaries is self-standing and includes an electric lamp of illumination corresponding to that of a candle, a power source connected to said lamp and a housing in which the lamp and power source are mounted, wherein said housing in which the lamp is mounted includes a diffuser having a size and shape

resembling a hand holdable candle, and wherein said diffuser having a size and shape resembling a hand holdable candle has a translucence of such transmission and diffusion as to simulate the soft ambience of a glowing candle when the lamp within the housing is lit; and

An autoilluminating circuit coupled to each said at least one luminary of said set of luminaries operative in one mode in response to receipt of each said luminary on said portable stand adapted to removably support at least one luminary each adapted to be received on and removed from said portable stand to place said lamp of each said at least luminary received on said portable stand in its "off" state, and operative in another mode in response to removal of each said at least one luminary from said portable stand adapted to removably support at least one luminary each adapted to be received on and removed from said portable stand to place said lamp of each said at least one luminary removed from said portable stand in its "on" state; whereby, each said at least one luminary lights if removed from said portable stand and de-lights if received on said portable stand.

In general in the presently preferred embodiments, the set of luminaries includes one or more luminaries each of which is inductively coupled to the first circuit of the recharging platter. The inductive coupling provides automatic, hands-free recharging of the rechargeable battery pack of a luminary upon its receipt by the recharging platter, and provides automatic, hands-free actuation of a luminary when it is removed therefrom.

In the presently preferred embodiments, each luminary of the set of luminaries is self-standing and includes a diffuser that may be shaped to resemble a candle releasably mounted to a base member supporting said light emitting element therewithin.

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### BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects, advantageous features and inventive aspects of the present invention will be more fully appreciated as the same becomes better understood from the following detailed description of the preferred embodiments when considered in connection  
10 with the accompanying drawings, in which:

FIGURE 1 is a perspective view of an exemplary embodiment of the present invention, showing a charging stand and one lamp module;

FIGURE 2 is a top view of the charging stand;

FIGURE 3 is a front view of the charging stand;

15 FIGURE 4 is a bottom view of the charging stand;

FIGURE 5 is a sectional view of the charging stand, taken along line 5-5 of FIGURE 2;

FIGURE 6 is a sectional view of the charging stand, taken along line 6-6 of FIGURE 2;

FIGURE 7 is a circuit diagram of the charging stand circuit;

20 FIGURE 8 is an exploded perspective view of an exemplary embodiment of a lamp module according to the present invention;

FIGURE 9 is a front view of the lamp module;

FIGURE 10 is a right side view of the lamp module;

FIGURE 11 is a top view of the lamp module;

FIGURE 12 is a bottom view of the lamp module;

FIGURE 13 is a sectional view of the lamp module taken along line 13-13 of FIGURE 9;

FIGURE 14 is a sectional view of the lamp module taken along line 14-14 of FIGURE 10.

FIGURE 15 is a sectional view of the lamp module taken along line 15-15 of FIGURE 9; and

FIGURE 16 is an exemplary embodiment of a circuit diagram of the lamp module circuit board according to the present invention.

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#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGURE 1, reference numeral 10 generally refers to the rechargeable lamp system of the present invention. Lamp system 10 comprises a charging stand 12 and a plurality of lamp modules 110, 111, 112 and 114.

As shown in FIGS. 1 and 2, stand 12 comprises slots 16, 18, 20 and 22 which are each adapted to removably receive one of said lamp modules 110, 111, 112 and 114. Slots 16, 18, 20 and 22 each include a respective cylindrical wall 38, 40, 42, and 44 and a substantially planar floor 46, 48, 50 and 52.

A power cord 24 having an inline power switch 26 and a "wall-block" style transformer provides power to charging stand 12 via ordinary 120-volt household current. In alternate embodiments, the transformer may be dispensed with.



As will be described in greater detail herein, each of modules 110, 111, 112 and 114 is battery-powered and designed to be charged by magnetic induction when placed in a respective one of slots 16, 18, 20 and 22. Modules 110, 111, 112 and 114 are each designed to illuminate when removed from slots 16, 18, 20 and 22, or when AC power is cut off to charging stand 12.

5 The number of lamp modules (and a corresponding slot for each module) shown in the preferred embodiment is intended to be merely exemplary. It should be understood that the lamp system 10 of the present invention may be constructed with any number of modules.

Referring now to FIGS. 3-4, stand 12 also includes an upper portion 30 and a lower portion 32. In an exemplary embodiment, upper portion 30 is ceramic. However, upper  
10 portion 30 may be made from other suitable materials, such as wood or plastic. In the interest of economy, lower portion 32 in the exemplary embodiment is formed of injection-molded plastic, but may as well be made of other suitable materials, such as steel or other metal or other material. In the exemplary embodiment, upper portion 30 and lower portion 32 snap together. However, any suitable means, such as bonding, screws, etc. could be used to secure  
15 upper portion 30 and lower portion 32.

As shown in FIGS. 2, 5 and 6, stand 12 further includes a circuit board 58 which is hard-wired to cord 24 and four primary induction coils (wired in parallel), one coil encircling each of walls 38, 40, 42 and 44, respectively. FIGURE 5 shows a pair of primary induction coils 54 and 56 that encircle walls 44 and 42, respectively. Identical primary coils (not shown)  
20 encircle walls 38 and 40.

FIGURE 7 shows the circuit formed by transformer 28, inline power switch 26, and primary induction coil 54. As shown in FIGURE 7, transformer 28 converts 120 volts AC to 12 volts AC. The three other primary induction coils, not shown, are preferably wired in

parallel with primary induction coil 54. . In other embodiments, the transformer component can be replaced by the inductor coils (on the platter and luminaries), whose turn-ratios are selected to provide a stepped-down voltage to the lamps. As will be appreciated by those of skill in the art, an oscillator providing frequencies higher than line frequency may be employed to improve efficiency (inductor size and attendant cost).

Modules 110, 111 and 112 are identical to module 114. Thus, it will only be necessary to describe module 114 in detail.

As shown in FIGS. 8-16, module 114 comprises a diffuser 116, a light bulb 118, a battery pack 120, a circuit board 122, a secondary induction coil 124 and a base 126.

Diffuser 116 in the exemplary embodiment is formed of blow-molded plastic (or glass) having a frosted outer surface 142. It could also be injection-molded plastic with a frosted, translucent finish. In the exemplary embodiment, diffuser 116 is slender and elongated in shape and includes a mid-section 146 that tapers upwardly to a tip 144 and tapers slightly to a tail 148. This shape is chosen to provide optimal light color and transmission, as well as even diffusion of light from bulb 118. Obviously, numerous alternative shapes for diffuser 116 are possible. However, the internal volume created by diffuser 116 must be sufficient to envelop bulb 118, battery pack 120 and circuit board 122. In addition, because of the heat generated by bulb 118, it is desirable to provide air space between bulb 118 and diffuser 116 to prevent diffuser 118 from melting or deforming.

Base 126 comprises a lower portion 128 that provides stable support for module 114 when placed on a level surface or within slot 16. Neck 130 is adapted to removably receive diffuser 116 (to enable access to bulb 118 and battery pack 120). Neck 130 includes tabs 134,

136, 138 and 140 and a lip 135 that cooperate to secure tail 148 of module 114 to neck 130 (see FIGURES 8, 13 and 14).

Battery pack 120 in the exemplary embodiment comprises three "AA" Nickel-Cadmium (Ni-Cad) cells wrapped in PVC shrink-wrap and having a total output of 3.6Vdc and 500-800mA. Of course, other types and sizes of rechargeable cells, such as Nickel-Metal-Hydride or Lithium cells, could be substituted for the Ni-Cad cells. Such cells would provide more power, and charge more quickly than Ni-Cads, but are substantially more expensive.

The power requirements for bulb 118 are, of course, chosen to match the power output of battery pack 120. In the exemplary embodiment, bulb 118 is a conventional miniature incandescent bulb, such as Chicago Miniature Lamp, Inc. part # CM1738, having an output of 1 candela and having design power requirements of 2.80V and 60mA and an expected life of 6,000 hours. Of course, other lamps and types of light sources, such as a light-emitting diode (L.E.D.) may be substituted for bulb 118. The incandescent bulb shown is preferred because of its balance of cost, heat generation, power consumption, expected service life and brightness characteristics.

As shown in FIGS. 13 and 14, bulb 118 and battery pack 120 are preferably hard-wired to circuit board 122. As shown in FIGURE 16, circuit board 122 comprises four primary circuits that control the charging of battery pack 120 and the lighting of bulb 118.

A charging circuit 150 regulates the voltage and current flowing to battery pack 120 from secondary induction coil 124 to prevent damage to battery pack 120. A latch circuit 154 cuts off current to bulb 118 when the voltage output of battery pack 120 drops below 3.1 volts, thus preventing damage to battery pack 120 which could be caused by fully draining battery pack 120. A charge-sensing switch 156 works in cooperation with latch circuit 154 to turn off

current to bulb 118 when current is detected in charging circuit 150. A constant current source circuit 152 provides a constant flow of current (65mA in the exemplary embodiment) to bulb 118. This enables bulb 118 to shine at a constant brightness despite fluctuations in the output current from battery pack 120. In alternate embodiments, a constant voltage source could be employed.

As described above, battery pack 120 is charged by magnetic induction. The magnetic field created by primary induction coil 54 (when current is applied) induces a current in secondary induction coil 124 when secondary induction coil 124 is concentrically located relative to primary induction coil 54. In the present invention, this occurs when module 114 is placed within slot 16 (see FIGURE 1).

It is preferable to ship battery pack 120 fully charged, as this will increase the shelf life of the Ni-Cad cells. However, shipping battery pack 120 fully charged requires the inclusion of means for electrically isolating battery pack 120 from lamp 118 between the time battery pack 120 is charged and when module 114 is first used by an end consumer. Such means could comprise a Mylar tab (not shown) inserted between two electrical contacts after the initial charging which would be removed by the consumer before first use. Alternatively, such means could comprise a fusible link (not shown). The fusible link would be adapted to close current regulating circuit 152 when current is sensed in charging circuit 150 (i.e., the first time the consumer plugs in charging stand 12).

Operation of lamp system 10 is elegantly straightforward. As described above, bulb 118 is designed to illuminate when no current is sensed in charging circuit 150. Thus, bulb 118 will automatically turn on when module 114 is removed from slot 16. Charging stand 12 and module 114 can also function as a table lamp by leaving module 114 in slot 16 and switching

off inline power switch 26. Module 114 also functions as an emergency light -- automatically turning on during a power failure.

The present invention in its broader aspects is not limited to the described embodiments, and departures may be made therefrom without departing from the principles of  
5 the invention and without sacrificing its primary advantages. Obviously, numerous modifications may be made to the present invention. Thus, the invention may be practiced otherwise than as specifically described herein.

WHAT IS CLAIMED IS:

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## CLAIMS

1. An autoilluminating rechargeable lamp system providing soft, candle-like ambient lighting about indoor and outdoor locations, comprising:

a portable charging stand removably supporting a set of luminaries removably supported on the portable charging stand, wherein the portable charging stand and set of luminarie supported on the portable charging stand are freely movable to any indoor and outdoor location, allowing the charging stand to be moved to any indoor and outdoor location and allowing each luminary of the set of luminaries removably supported on the charging stand to be individually removed and placed in the environment of that location;

said portable charging stand removably supporting said set of luminaries including a charge circuit providing a charge signal to each luminary of said set of luminaries supported by said stand;

each said luminary of said set of luminaries is self standing on and freely removable from the charging stand and provides the illumination and ambience of candles without suffering their undesirable disadvantages of self-consumption, smoke, unintended extinguishment and wax buildup, each said luminary of said set of luminaries including an electric lamp of illumination corresponding to that of a candle, a rechargeable battery pack connected to said lamp and a housing in which the lamp and rechargeable battery pack are mounted, wherein said housing in which the lamp is mounted includes a diffuser having a size and shape resembling a hand holdable candle, and wherein said diffuser having a size and shape resembling a hand holdable candle has a translucence of such transmission and diffusion as to simulate the soft ambience of a glowing candle when the lamp within the housing is lit; and

autoilluminating means coupled to each luminary of said set of luminaries and responsive to said charge signal for lighting said lamp of each luminary in response to non-detection of said charge signal, and for de-lighting said lamp of each luminary in

response to detection of said charge signal, whereby, each said luminary of said set of luminaries lights if removed from said portable charging stand and de-lights if supported thereby.

2. The autoilluminating rechargeable lamp system of claim 1, wherein said set includes one or more luminaries.

3. An autoilluminating lamp system providing soft, candle-like ambient lighting about indoor and outdoor locations, comprising:

a portable stand removably supporting a set of luminaries removably supported on the portable stand, wherein the portable stand and set of luminaries supported on the portable stand are movable to any indoor and outdoor location, allowing the charging stand to be moved to any indoor and outdoor location and allowing each luminary of the set of luminaries removably supported on the portable stand to be individually removed and placed in the environment of that location;

said portable stand is adapted to removably support at least one luminary receivable on and removable from said portable stand;

each said luminary of said set of luminaries is self standing on and freely removable from the charging stand and provides the illumination and ambience of candles without suffering their undesirable disadvantages of self-consumption, smoke, unintended extinguishment and wax buildup, each said luminary of said set of luminaries is self-standing and includes an electric lamp of illumination corresponding to that of a candle, a power source connected to said lamp and a housing in which the lamp and power source are mounted, wherein said housing in which the lamp is mounted includes a diffuser having a size and shape resembling a hand holdable candle, and wherein said diffuser having a size and shape resembling a hand holdable candle has a translucence of such transmission and diffusion as to simulate the soft ambience of a glowing candle when the lamp within the housing is lit; and

an autoilluminating circuit coupled to each said at least one luminary of said set of luminaries operative in one mode in response to receipt of each said luminary on said portable stand adapted to removably support at least one luminary each adapted to be received on and removed from said portable stand to place said lamp of each said at least luminary received on said portable stand in its "off" state, and operative in another mode in response to removal of each said at least one luminary from said portable stand adapted to removably support at least one luminary each adapted to be received on and removed from said portable stand to place said lamp of each said at least one luminary removed from said portable stand in its "on" state; whereby, each said at least one luminary lights if removed from said portable stand and de-lights if received on said portable stand.

4. The autoilluminating lamp system of claim 3, wherein each said at least one luminary is a rechargeable luminary; and wherein said power source of each said at least one rechargeable uminary is a rechargeable battery.

5. The autoilluminating lamp system of claim 4j, further including a charge circuit adapted to provide a charge signal in response to supplied AC power; and wherein said autoilluminating circuit operative in response to receipt of each said at least one luminary on said portable stand is further operative in said one mode to apply said charge signal to said rechargeable battery of each said at least one rechargeable luminary received on said portable stand.

6. An auto illuminating lamp system, substantially as herein described with references to any one or more of the drawings.

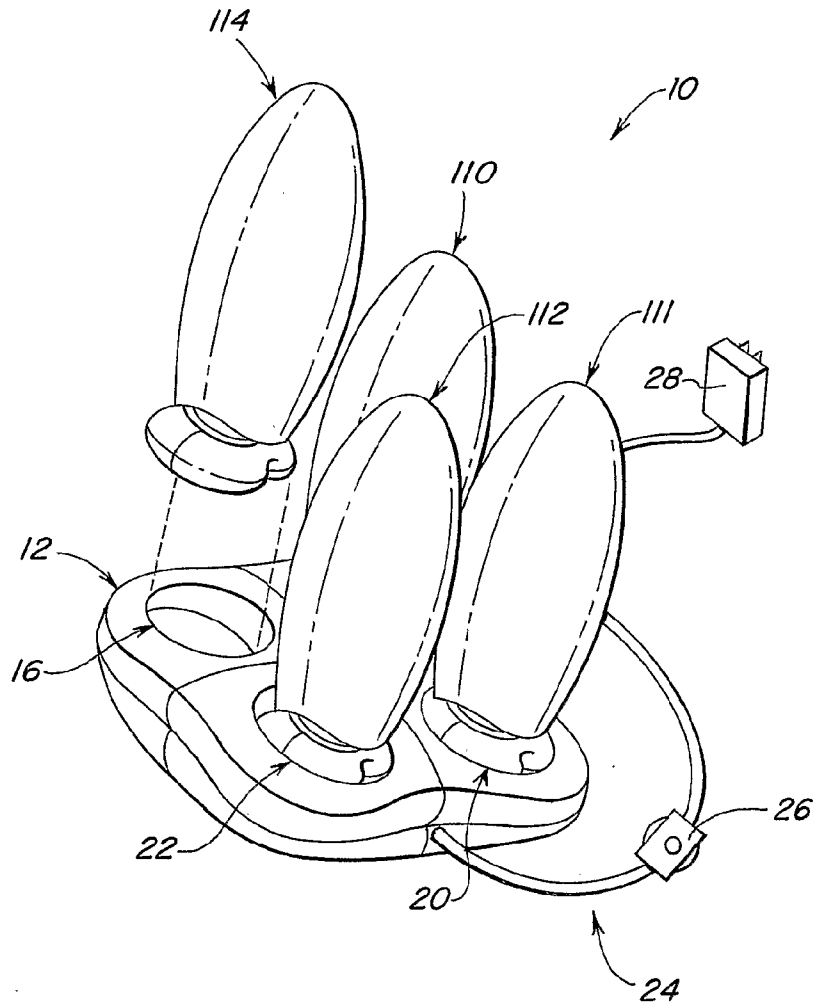
Dated this 26<sup>th</sup> day of July 2005

VESSEL, INC.

By:

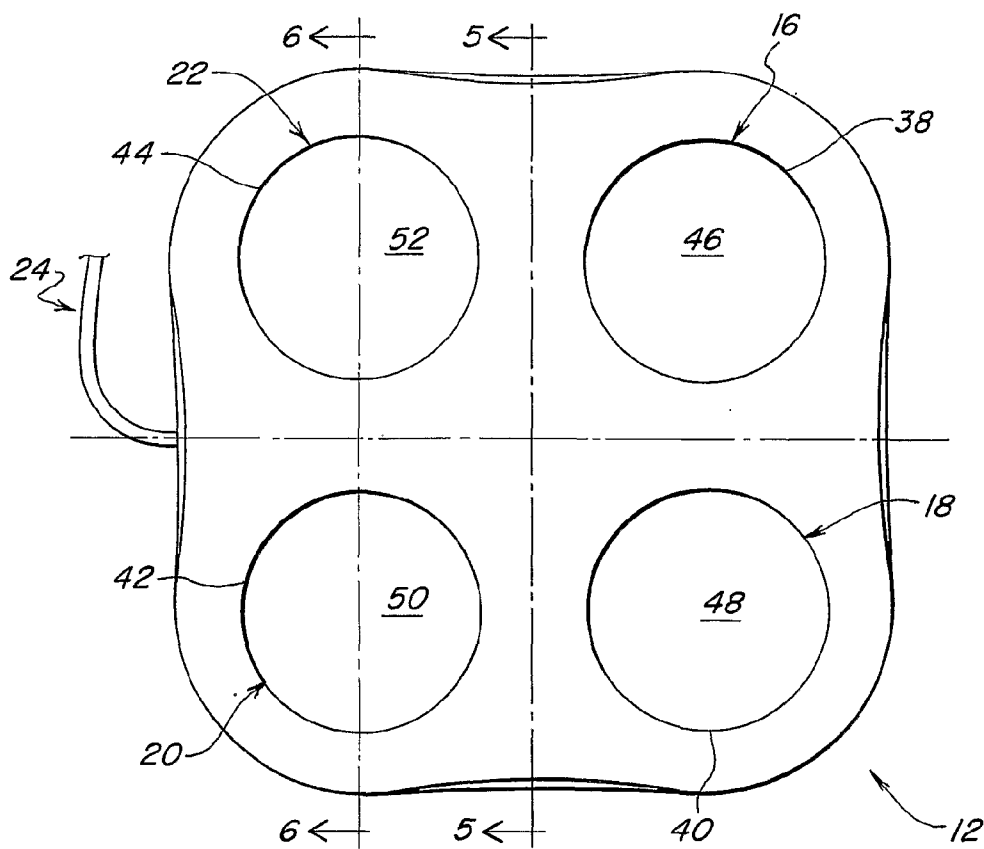
HODGKINSON McINNES PAPPAS  
Patent Attorneys for the Applicant



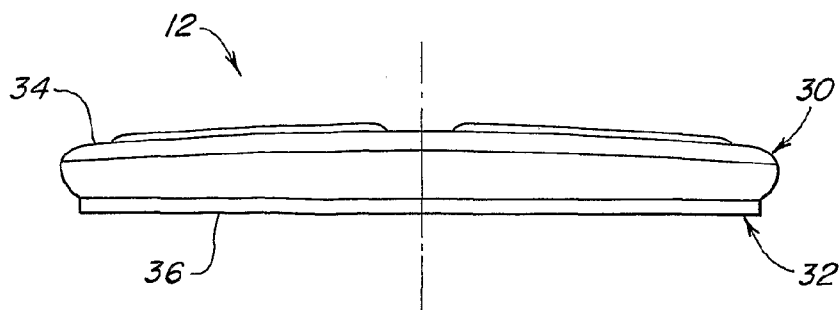


**FIG. 1**

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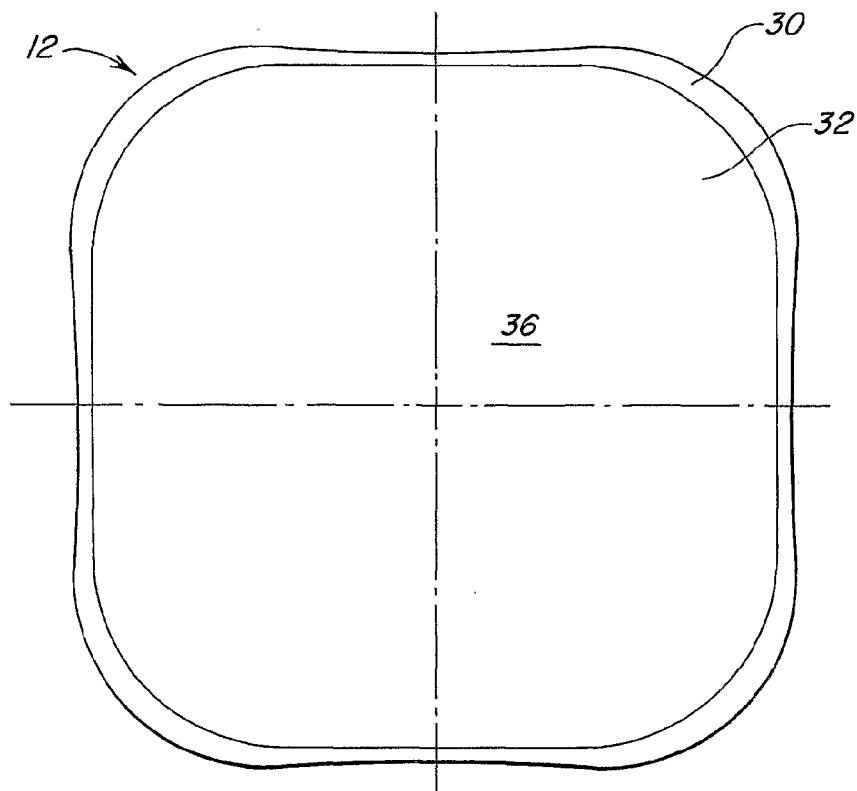


**FIG. 2**

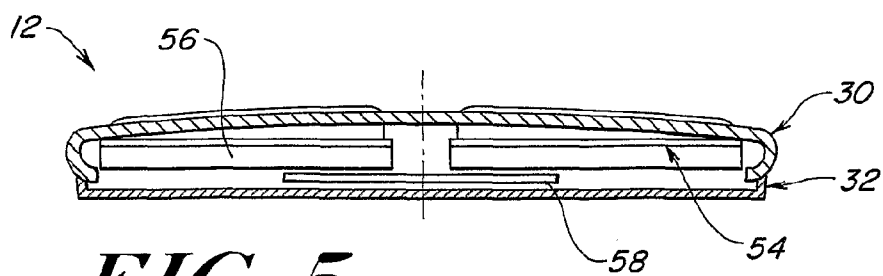


**FIG. 3**

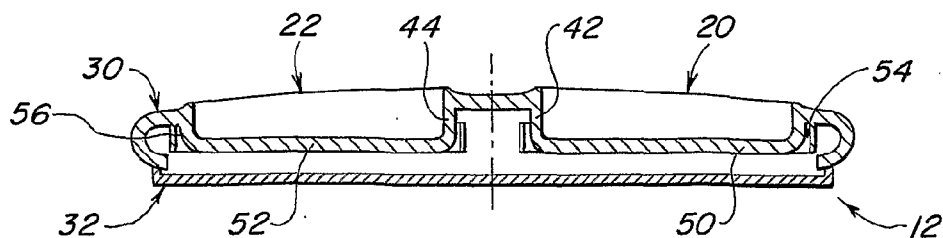
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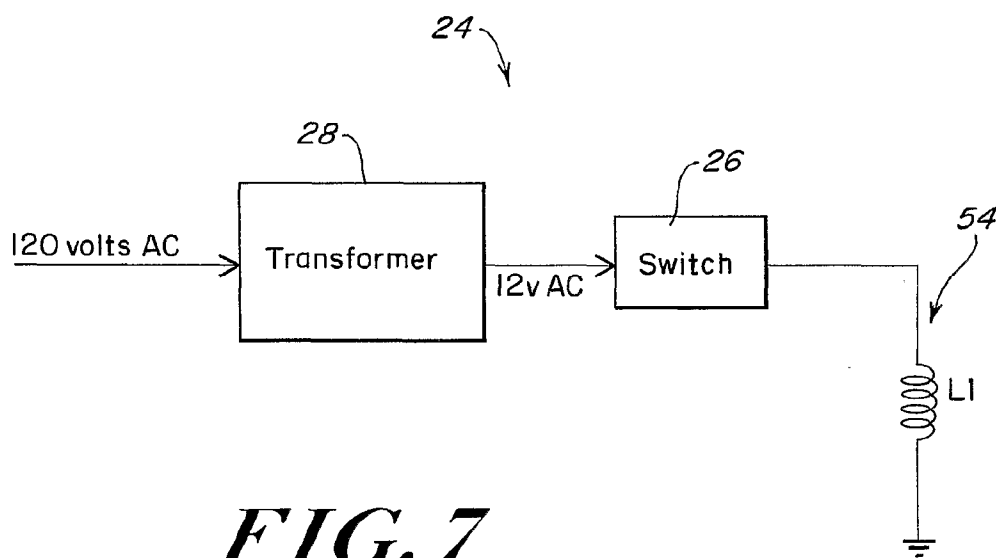
**FIG. 4**



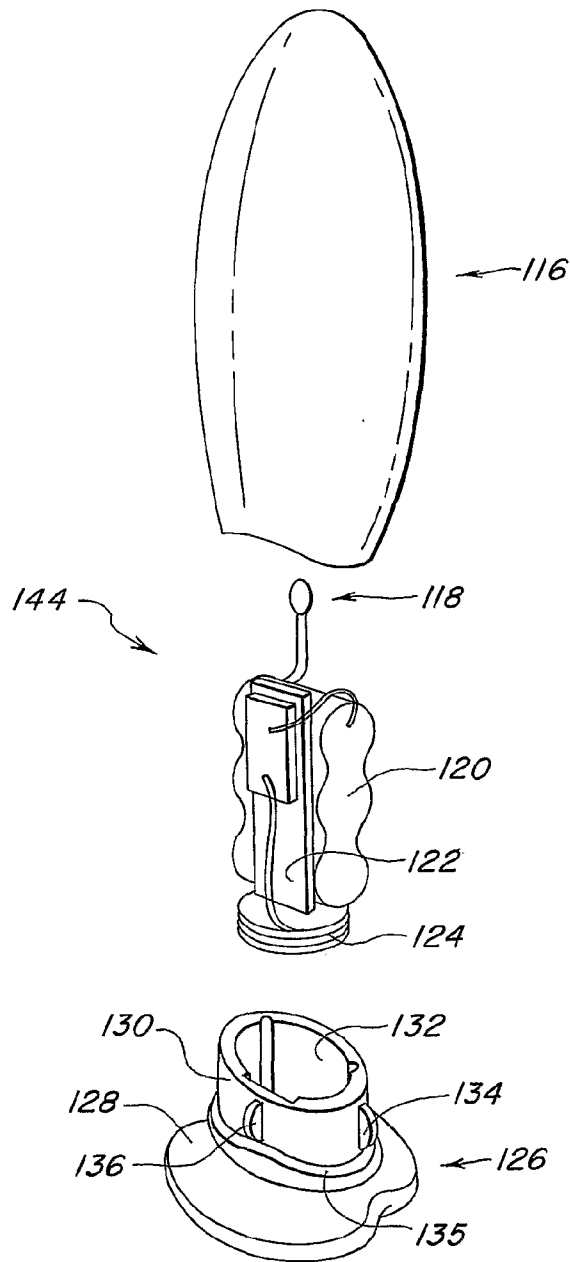
**FIG. 5**



**FIG. 6**

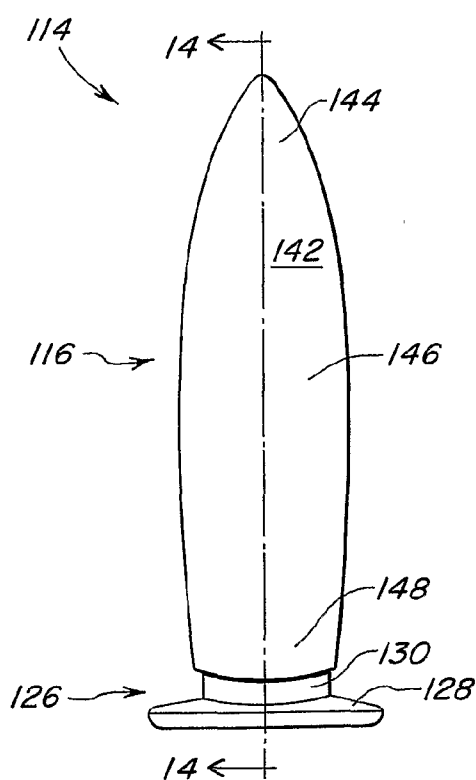
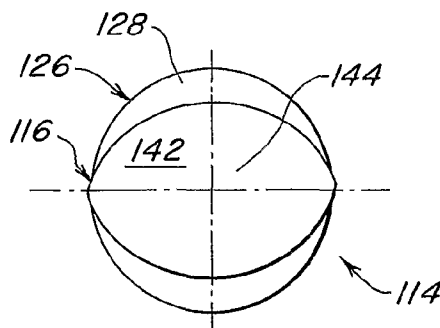


**FIG. 7**

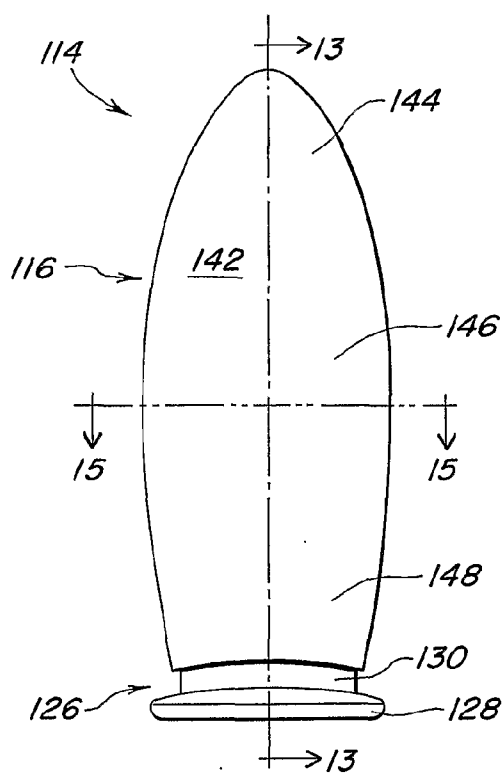


**FIG. 8**

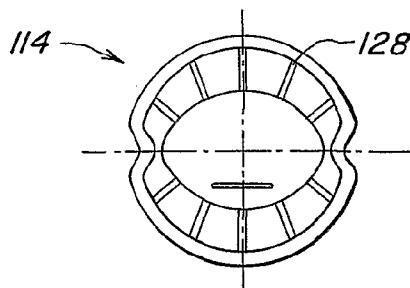
**FIG. 11**



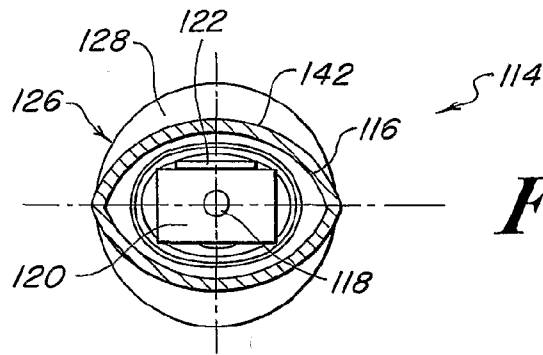
**FIG. 10**



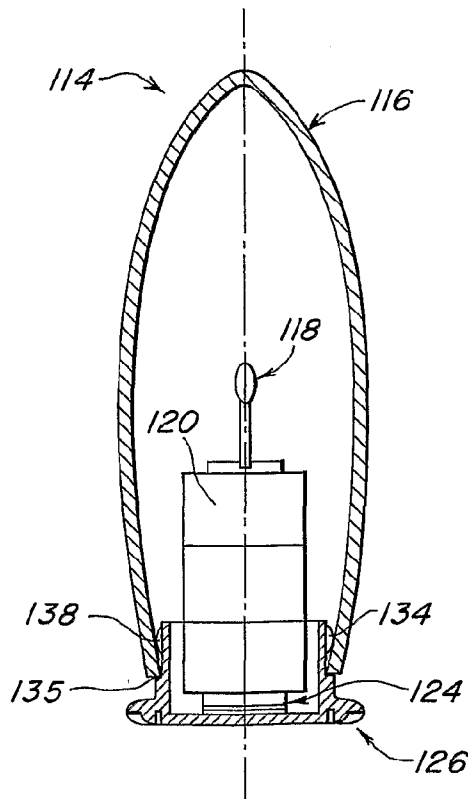
**FIG. 9**



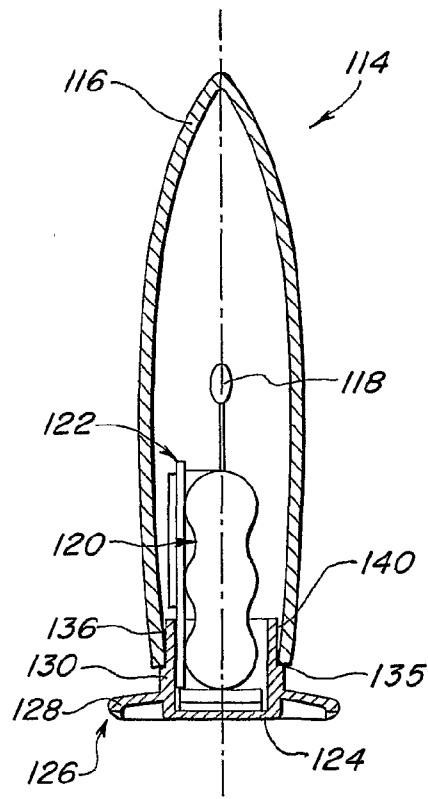
**FIG. 12**



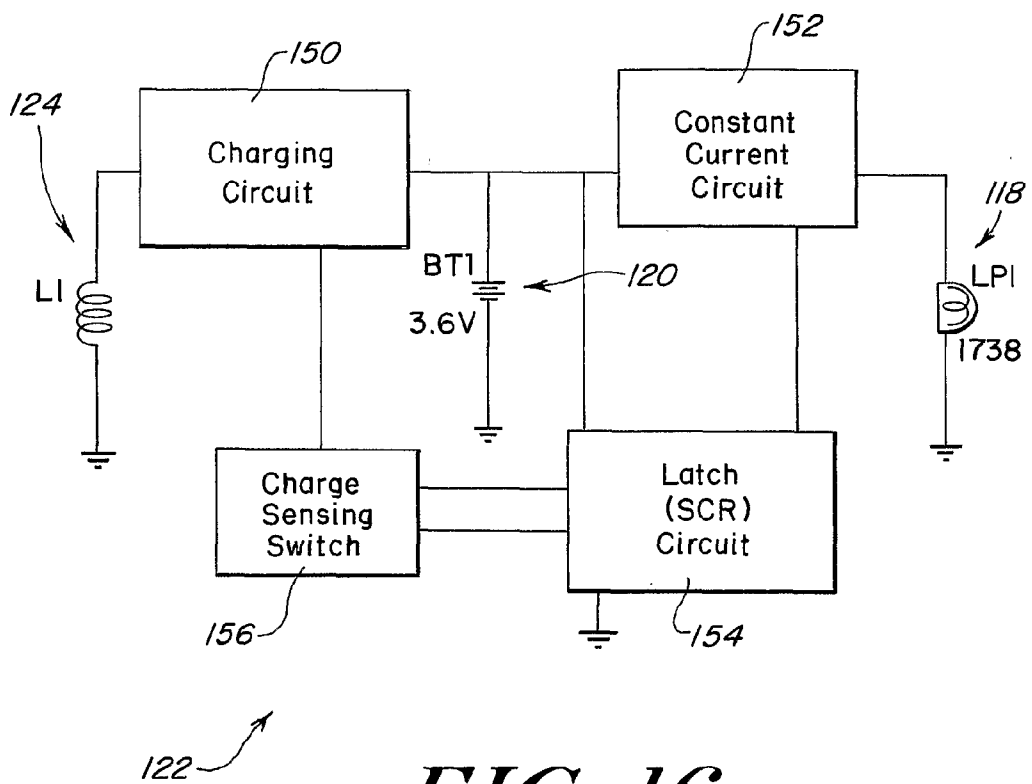
**FIG. 15**



**FIG. 14**



**FIG. 13**



**FIG. 16**