A lighted balloon system is provided including an inflatable, metallized polyfilm balloon device, having a surface, and a relatively lightweight, flat electroluminescent display device mounted to the surface of the balloon device. The lighted balloon system further includes a power supply, and one or more circuits disposed on the surface of the inflatable device electrically communicating the power supply and the display device for illumination thereof.
**FIG. 5A**

Phosphor

Happy Birthday

**FIG. 5B**

Insulator

Happy Birthday
FIG. 5C

Happy Birthday

Silver

FIG. 5D

Rear seal

Happy Birthday
ELECTROLUMINESCENT DISPLAY APPARATUS FOR AN INFLATABLE DEVICE AND METHOD

RELATED APPLICATION DATA

[0001] The present application claims priority under 35 U.S.C. §119 to U.S. Provisional Application Ser. No. 60/724,553, naming Haynes as the inventor, filed Oct. 6, 2005, and entitled LIGHTED BALLOON DESIGNS, which is incorporated herein by reference in its entirety and for all purposes.

FIELD OF THE INVENTION

[0002] The present invention relates generally to inflatable devices, and more specifically inflatable balloons capable of being fabricated with thin, flat, flexible electroluminescent displays that can be printed on or laminated onto the balloon without inhibiting operation of the displays.

BACKGROUND OF THE INVENTION

[0003] Conventional latex or chloroprene helium filled inflatable balloons have remained relatively unchanged since their creation. Depending upon the quality of the material, these expandable balloons, while inexpensive, permit the helium to escape or dissipate over a relatively short time period. More recently, metallized polyester (MYLAR®) has been developed representing a significant advancement in balloon material technology.

[0004] Since the development of metallized polyester balloons, there has been very little development or technological advancement in the other balloon technology fields that spur renew interest. One potential balloon technology, however, is the application of illuminated displays with the inflatable device. Unfortunately, the difficulty of fabrication and the current array of illuminated display selection, such as incandescent and light emitting diodes, inhibit the function of the helium filled balloon by adding weight and generating heat, rendering such designs impractical.

SUMMARY OF THE INVENTION

[0005] The present invention provides a lighted inflatable apparatus including an inflatable device, and a relatively lightweight, flat emissive display device applicable to the inflatable device for illumination of the emissive display while applied thereto.

[0006] In one embodiment, the inflatable device is a balloon device, such as a metallized polyfilm balloon, a non-metallized polyfilm balloon, a latex rubber balloon or a chloroprene balloon.

[0007] The inflatable apparatus includes a power supply operably coupled to the display device for illumination thereof. The power supply can be internal to the inflatable device, such as being disposed on its surface, or can be external to the inflatable device, such as being remote from the inflatable device.

[0008] In another specific embodiment, at least one display device electrode, operably coupled to the power supply battery, utilizes the metallized polyester of a metallized balloon for operation thereof. Further, one or more circuits disposed on the surface of the inflatable device electrically communicating the power supply and the display device. These circuits can be provided by etched multi-circuit ITO coated polyfilm, or can be printed on the surface of the balloon using printed conductive inks.

[0009] In another configuration, the display device is an electroluminescent display capable of being printed directly onto a surface of the inflatable device, using one of ink-jet printing, screen-printing and rotogravure printing.

[0010] The electroluminescent display may be comprised of light emitting polymers, OLED, or light emitting electroluminescent phosphors ACPEL.

[0011] In yet another embodiment, the flat emissive display device is configured to emits transmissive light from both a front side and a back side thereof. This arrangement is particularly suitable for an electroluminescent display that is suspended internally within the balloon device. By providing one or more window portions in the metal coating of the metallized balloon (i.e., front and rear side), both sides of the display may be viewed.

[0012] Another specific embodiment includes an electroluminescent display mounted to a metallized balloon device using a conductive adhesive. Hence, using the metallized coating the balloon device, together with the conductive adhesive, the power can be transferred to the rear electrode of the display device.

[0013] In another aspect of the present invention, a lighted balloon system is provided including an inflatable, metallized polyfilm balloon device having a surface, and a relatively lightweight, flat electroluminescent display device mounted to the surface of the balloon device. The system further includes a power supply, and one or more circuits disposed on the surface of the balloon device electrically communicating the power supply and the display device for illumination thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The assembly of the present invention has other objects and features of advantage which will be more readily apparent from the following description of the best mode of carrying out the invention and the appended claims, when taken in conjunction with the accompanying drawings, in which:

[0015] FIG. 1 is a front elevation view of an illuminated balloon system with an electroluminescent lamp (EL lamp) constructed in accordance with the present invention.

[0016] FIG. 2 is a bottom perspective view of the balloon system of FIG. 1.

[0017] FIG. 3 is a front elevation view of an interior rear half of the embodiment of the illuminated balloon system of FIG. 9, illustrating the connection terminals.

[0018] FIG. 4 is an enlarged side elevation view, in cross-section, of one specific embodiment of an EL lamp of the balloon system of FIG. 1.

[0019] FIGS. 5A-5D is a sequence of fragmentary, top plan views of the EL lamp of FIG. 4, illustrating the layered fabrication.

[0020] FIG. 6 is an enlarged side elevation view, in cross-section, of another specific embodiment of an EL lamp of the balloon system of FIG. 1.
FIG. 7 is a front elevation view of still another specific embodiment of the illuminated balloon system of FIG. 1, having an internal EL lamp suspended by a filament.

FIG. 8 is a front elevation view of another specific embodiment of the illuminated balloon system of FIG. 7, having the internal EL lamp suspended by a vertical suspension strip.

FIG. 9 is a side elevation view, in cross-section, of yet another specific embodiment of the illuminated balloon system of FIG. 7, having the internal EL lamp suspended by horizontal suspension strips.

FIG. 10 is a side elevation view of another specific embodiment of the illuminated balloon system of FIG. 1.

FIG. 11 is a front elevation view of yet another specific embodiment of the illuminated balloon system of FIG. 1, having a hoop-shaped EL lamp.

FIG. 12 is a front elevation view of yet another specific embodiment of the illuminated balloon system of FIG. 1.

FIG. 13 is a front elevation view of still another specific embodiment of the illuminated balloon system of FIG. 1.

DETAILED DESCRIPTION

While the present invention will be described with reference to a few specific embodiments, the description is illustrative of the invention and is not to be construed as limiting the invention. Various modifications to the present invention can be made to the preferred embodiments by those skilled in the art without departing from the true spirit and scope of the invention as defined by the appended claims. It will be noted here that for a better understanding, like components are designated by like reference numerals throughout the various figures.

Referring now to FIGS. 1 and 2, a lighted inflatable system, generally designated 40, is provided including a flexible, inflatable device, generally designated 4, having a surface (that could be an internal surface or an external surface), and a relatively lightweight, flat display device, generally designated 1, mounted and/or fabricated directly to the surface of the inflatable device. The system further includes a power supply 3, and one or more circuits or conductors 9, 10 electrically communicating the power supply 3 and the display device 1 for illumination thereof.

Accordingly, a flexible inflatable device, such as a conventional inflatable balloon composed latex or MYLAR® (polyester), is provided that is capable of cost effectively supporting, mounting and/or fabricating a light weight illuminant displays device directly thereon. Such a solution is highly desirable in that illumination by other means such as incandescent, light emitting diodes and enabling components inhibit the function of the helium filled balloon by adding weight and generating heat normally associated with these methods of illumination.

More particularly, in one specific embodiment, the inflatable system 40 includes the flexible balloon device 4 having the display device 1 capable of being mounted directly to or being fabricated directly on a surface of the balloon device. For example, the balloon device 4 may be provided by a metallized polyester material (e.g., a MYLAR® balloon with an outer metal coating 41 (FIG. 6)) upon which the display device is disposed. The display device 1 itself must be relatively lightweight so that conventional sized helium filled balloons will be capable of lifting the collective weight of the balloon and display device. Further, the display device should be energy efficient for practicality of use.

More recently, relatively flat electroluminescent displays (i.e., EL lamp) have been developed that are particularly suitable to this application. Such displays will be set forth in greater detail in the description of FIGS. 4 and 6.

Referring back to the embodiment of FIG. 1, the power supply 3, in this example, is separated and external to the balloon device. Hence, a variety of the power sources may be applied that are capable of remotely powering EL lamps. For example, an inverted power source, such as conventional AA batteries, may be applied. The power supply 3 may also include a switch element and an inverter, which typically includes a transformer and switching components (all of which are not shown), capable of creating an alternating current needed to power the EL lamp 1.

As will be described in greater detail below, the power supply 3 may incorporate other types of power sources, such as an internal power source, or one carried on and/or supported by the balloon device itself. For example a printable battery technology may be utilized that is capable of printing a power source on the surface of the balloon device using the printing techniques above-mentioned. Typical of such technology may be found in U.S. Pat. No. 7,022,431 to Shchori et al., filed Aug. 20, 2001, and entitled THIN LAYER ELECTROCHEMICAL CELL WITH SELF-FORMED SEPARATOR, herein incorporated by reference in its entirety.

To couple the display device 1 to the power supply, the lighted inflatable system includes two or more circuits or conductors 9, 10 electrically inter-coupling respective electrodes of the power source and the respective electrodes of the display device 1. The conductors 9, 10 themselves may be printed onto the balloon surface using a conductive ink, for example. In another example, the metal coating itself may be applied as a conductor by etching, removing and/or insulating the conductors from the surrounding metal coatings.

As best viewed in FIGS. 2 and 3, in one embodiment, the conductors 9, 10 extend down a neck portion of the filler valve 4c of the balloon device 4, terminating at respective terminal electrodes 9a, 10a of a proximal contact region 18. For the embodiment of FIG. 1, where an external power supply 3 is employed, a proximal power contact region 18 of the conductors 9, 10 electrically communicate with a lightweight multi-conductor wire 2, which in turn communicate with the power supply. Accordingly, when the power supply is operably coupled to the EL lamp 1, via a switching element, the power source illuminates the display device.

The multi-conductor wire 2 should also be sufficiently lightweight so as to minimize the collective weight carried by the inflatable balloon device. Examples of such thin and lightweight multi-conductor wire include light...
emitting wire, light emitting polymer wire comprising coaxial construction and light emitting electroluminescent wire or filament U.S. Pat. No. 5,876,863 to Feldman et al., filed Dec. 19, 1996, and entitled ELECTROLUMINESCENT FILAMENT, incorporated by reference in its entirety. In one example, the external power supply can also function as a table weight, while the multi-conductor wire functions as a means for securing the floatable balloon device 4 to the external power supply 3. Hence, the lightweight multi-conductor wire 2 not only functions as a power conduit, but also functions to secure the helium inflatable balloon, while illuminated conductors add to the overall effect of the illuminated display.

[0038] Several methods of electrical connection may be used to connect the power supply 3 to the terminal electrodes 9a, 10a of the power contact region 18, shown in FIGS. 2 and 3. One example connection includes the application of a printed power connector 36 containing respective universal terminal electrodes 9b, 10b. A z-axis conductive adhesive material embedded with isolated conductive particles that convey power thru the material while not conducting from side to side or xy (not shown) may be applied that an substrate of the ad for the purpose of the ad. Thus, by simply peeling the backing layer off the z-axis adhesive, the terminal electrodes 9b, 10b at the power connector 36 can be connected to the terminal electrodes 9a, 10a at the proximal contact region. The power connector 36, in turn, is connected to the multi-conductor wire 2 by soldering it to connector pins (not shown) that are crimped onto electrodes 9b and 10b.

[0039] In the preferred embodiment, as mentioned, the display device 1 is provided by a substantially flat, substantially flexible electroluminescent lamp 1 that is sufficiently lightweight so as to enable conventional sized helium filled inflatable balloons to still float. FIG. 4 best illustrates a cross section view an example EL lamp device 1 suitable for mounting to a mounting surface 42 of the balloon device 4. In this particular configuration, the EL lamp device can be independently constructed, and operably secured to a surface (i.e., exterior surface or interior surface) of any type inflatable balloon device 4, such as a common latex balloon device 4.

[0040] Initially, as best illustrated in FIGS. 4 and 5A, a transparent substrate 24 is provided that is coated with a transparent conductor 25 (i.e., the front electrode). The transparent substrate 24 functions as the exterior surface the EL lamp 1. When mounted to the balloon device 1. In one specific example, the transparent substrate 24 is composed Polyethylene Terephthalate (PET), while the transparent conductor 25 material is composed of Indium Tin Oxide (ITO). In other embodiments, as will be described, the material of the transparent conductor may be replaced by a printed conductive layer of Atomony Tin Oxide (ATO) embedded ink or binder (i.e. Dupon translucent conductor #7162 utilizing two transparent or translucent conductors as opposing electrodes for energizing the phosphor enabling light emission from both or opposing sides of an electroluminescent lamp. In other embodiments, the front electrode 25 and the rear electrode 28 (to be discussed) may be foraminous electrodes where an opaque conductor material may be applied, such as AG500 silver.

[0041] While this configuration of the EL lamp may be fabricated using various conventional techniques, this sub-

stantially flat lamp is particularly suitable for printed fabrication. That is, most if not all of the subsequent material layers, atop one another, can be applied using printing techniques. Such techniques include, but are not limited to, ink-jet printing, screen-printing and rotogravure printing.

[0042] Briefly, the composition and forward build printing sequence of the EL lamp 1 will now be described using FIGS. 4 and 5A-5D. It will be appreciated, however, that the thickness of each layer shown is not proportional, and merely shown as being equal for illustrative purposes.

[0043] Turning now to FIG. 5A, the transparent conductor layer 25 (front electrode) is followed by a light-emitting layer 26 of phosphor. The phosphor in the phosphor layer generates the light emission that is caused by the excitation from the front electrode 26 and a rear electrode 28. This phosphor layer 26 preferably consists of zinc sulfide crystals, for example, suspended in a binder. The phosphor itself can be conventionally selected for the desired color emission. For instance, one example of a suitable phosphor includes, Dupont phosphors embedded in Dupont binder #7155.

[0044] The binder, on the other hand, is selected to have a viscosity sufficient for print fabrication. This permits the additive particles to be uniformly suspended in the binder during the application process, while at the same time, enables print fabrication directly onto the transparent conductor 25. This application process, which is in part dependent upon the selected binder, includes curing by heat or ultra violet radiation.

[0045] To insulate the phosphor layer 26, an insulating layer 27 is then disposed atop the phosphor layer (FIG. 5B). This insulating layer 27 provides an insulating barrier from electrical shorts caused by offset bias of the high voltage alternating current or pulsed direct current (DC) penetrating the phosphor layer 26 from the rear electrode 28 to the front electrode 25. This insulating layer 27, in one example, consists of at least one print layer of a dielectric material. One example of a suitable dielectric insulator includes barium titanate particles suspended in a printable binder. Again, the viscosity of the binder is selected to enable print fabrication, while at the same time being sufficiently viscous to allow the additive particles to be uniformly suspended in the binder. Similar to the application of the printable phosphor layer 26 above, the printable dielectric insulator is then cured in the same manner as the previous layers.

[0046] Referring now to FIG. 5C, the rear electrode layer 28 is next disposed atop the dielectric insulating layer 27. This rear electrode 28 is what actually causes the lamp to illuminate. While the insulating layer 27, as indicated, provides a barrier from electrical shorts caused by the rear electrode 28 sweeping through the phosphor layer 26 to the front electrode 25, a sufficient potential and electrical flow between display electrodes, via the power switch, excites the phosphor layer 26. Thus, in general, the distal ends of the respective conductors 9, 10 terminate at, and are electrically coupled to, the respective front electrode 25 and the rear electrode 28 of the display device 1.

[0047] In certain embodiments, the electrically conductive rear electrode 28 is provided by silver particles suspended in the binder material during the application process. Again, such an application may consist of a printable binder pro-
procedure employed to print the rear electrode layer directly to and in contact with the insulating layer 27.

[0048] In another specific embodiment, two separate circuits may be disposed on the layered EL lamp 1 during the deposition of the rear electrode sequence shown in FIG. 5C. One circuit corresponds to the rear electrode 28 that is applied directly to the barium titanate insulating layer 27. This rear electrode, as mentioned, is what actually causes the lamp to illuminate.

[0049] The second circuit is an outline conductor 30 (FIG. 5C) that is disposed on the exposed surface of the front electrode layer 25. This outline conductor 30 "outlines" the desired illumination shape of the EL lamp 1, and can be printed directly onto an outline shoulder portion 43 of the front electrode layer 25 that peripherally extends beyond the printed display electrodes and phosphor layer. It will be appreciated that the outline conductor 30 can be printed at the same time as the printing of the rear electrode 28 in FIG. 5C. Moreover, as shown in FIG. 2, when an outline conductor 30 is employed, the distal terminal of one of the printed conductors (e.g., conductor 10) is electrically coupled directly to the outline conductor 30, rather than directly to the front electrode.

[0050] Accordingly, during operation, the printed conductor 30 functions as a bus bar or current carrying trace that is applied to overcome the electrical resistance usually found in ITO layer (e.g., the transparent electrode 25). Generally, when the surface area of front electrode conductor layer of an EL lamp exceeds the conductive capabilities of a printed ATO conductor, an additional conductive material (i.e. Dupont AG500 silver conductor) can be used to apply conductive bus bars that convey power along greater distances of the front planar electrode.

[0051] The rear surface of the rear electrode 28 of the electroluminescent lamp 1 may also be insulated from the mounting surface 42 of the inflatable device 4, especially if the device is a metallized polyester or MYLAR® balloon device 4. Using common electrical insulating techniques such as cold lamination, heat lamination, and/or printing of an insulating layer 45 onto the rear electrode 28 (FIGS. 4 and 5D), such insulating can be provided. Typical of such substantially flat EL lamp designs shown in FIG. 4 may be found in U.S. Pat. No. 6,054,809 to Haynes et al., filed Aug. 13, 1997, and entitled ELECTROLUMINESCENT LAMP DESIGNS, herein incorporated by reference in its entirety.

[0052] To mount the finished electroluminescent lamp 1 to the mounting surface 42 of the balloon device 4, one technique includes the application of an adhesive between the backside of the lamp and the mounting surface 42 of the balloon (FIG. 5). For example, a double stick adhesive or printed adhesive 29 may be applied to the non-light emitting side of the lamp (i.e., which is then die cut or stamped to the outlining shape of the artwork as shown in FIG. 1.

[0053] Referring now to FIG. 6, another specific embodiment of an EL lamp 1 is illustrated, in cross section, having a significantly thinner profile than the embodiment of FIG. 4. It will be appreciated that this configuration is significantly thinner since the rear electrode of the EL lamp 1 is integrated into the balloon device itself, thereby eliminating the deposition of a separate rear electrode layer of the previous embodiment. That is, in a metallized polyfilm or MYLAR® balloon device 4, the metallic coating 41 of the balloon device itself is utilized as the rear electrode for the display device. Such a configuration, therefore, not only reduces the lamp thickness, but more importantly, reduces the overall EL lamp weight as well.

[0054] Similar to the previous EL lamp embodiment, the individual layers may be print fabricated. However, in this electroluminescent lamp embodiment, the display device layers may be print fabricated directly onto the mounting surface 42 of the metallized balloon 4 (e.g., a polyfilm balloon) itself, in a reverse build. Accordingly, using the metallic coating 41 of the balloon device 4 as the rear electrode, the next layer disposed atop the metallized balloon electrode 28 is a dielectric layer 27. Similar to that of the previous embodiment, in one example, this dielectric layer 27 is comprised of barium titanate suspended in a liquid, printable binder. Again, this printed layer is then cured by heat or ultra violet radiation

[0055] Next, the light emitting layer 26 of zinc sulfide phosphor particles is color selected, and then disposed, suspended in a binder is printed onto the dielectric layer 26. Again, the binder is cured by heat or ultra violet radiation. This phosphor layer 26 is then followed by printing a front electrode layer 34 there atop. This printable front electrode layer 34 is preferably composed of an ITO material that is also suspended in a liquid binder.

[0056] An outline conductor 30 is printed atop and in electrical contact with the front electrode 34 that peripherally outlines the desired illumination shape of the EL lamp 1. As mentioned, the outline conductor 30 functions as a bus bar or current carrying trace that is applied to overcome the electrical resistance usually found in ITO layer.

[0057] With only these three major printed layers, the EL structure is capable of emitting light when power is applied to the front and the rear electrodes 25, 28 of the lamp. As previously mentioned, the power source will be operably coupled to the at least a portion of the metal coating 41 of the balloon device 4, functioning as the rear electrode 28.

[0058] A layer of clear insulator 35 can be applied to encase the layered EL lamp, providing a moisture barrier. This insulator 35 similarly can be applied by printing over the entire printed lamp structure. Moreover, such an insulative layer will prevent any contact of the front electrode 34 with the rear electrode 28, should any compressive forces be applied to the EL lamp.

[0059] Either EL lamp embodiment (i.e., FIG. 4 or 6) can be externally mounted to the exterior surface of the balloon device 4 (FIGS. 1 and 2), or can be internally mounted to an interior surface of the balloon device 4 (not shown). In the embodiment of FIG. 6, of course, the interior surface of the balloon device 4 would at least have either an interior metal coating or have a rear electrode layer printed thereon (e.g., ITO conductive particles).

[0060] To power the surface mounted EL lamp of FIG. 6, the respective conductors 9, 10 similarly electrically communicate the front electrode 25 and the rear electrode 28 of the EL lamp 1 with the terminals of the power supply 2. One conductor (e.g., conductor 9 in FIG. 2) electrically communicates directly with the rear electrode 28 of the EL lamp, while the other conductor 10 electrically communicates directly with the outline conductor 30 and front electrode 25.
thereof. For EL lamps that do not require an outline conductor, such as those with smaller surface area EL lamps, the other conductor can electrically communicate directly with the front electrode 25.

[0061] Depending upon the type of balloon, the conductors 9, 10 can be printed directly on the selected balloon surface using conductive inks and the printing techniques described above. For example, multi-circuit ITO conductors 9, 10 can be printed atop the front and rear electrode terminals of the rearward built EL lamp. In other configurations, as will be described in greater detail below, more translucent circuits can be printed using translucent inks such as Dupont translucent conductor #7162. As shown in the embodiments of FIGS. 8 and 9, and as will be apparent, the translucent circuits are less visible from a distance, forming an illusion of a floating EL lamp internally within the balloon device 4.

[0062] In yet another example, conventional etching techniques can be applied to form and isolate the conductors 9, 10 from one another. This is particularly suitable for use with metallized polyester balloon device, where selected portions of the metallic coating can be isolated and etched away, forming the conductors 9, 10.

[0063] Referring now to FIGS. 7-13, alternative embodiment the inflatable systems 40 will be shown and described. For example, FIG. 7 illustrates a fish-shaped EL lamp 1 internally disposed within the interior of the balloon device itself. Unlike the previously mentioned internally disposed display device, however, the EL lamp 1 of this configuration is not mounted to an internal surface of the balloon device. Rather, the EL lamp is suspended within the internal space of inflated balloon device, and can be viewed through transparent front and/or rear windows 6, 5 formed in the balloon surface.

[0064] For a metallized polyester balloon, transparent openings can be formed in the metal coating 41 using chemical etching techniques. Once the selected portions of the metal coating are removed, the transparent windows 5, 6 will be formed in the metallized coating on the polyester, which in turn permit viewing of the EL lamp from one side or both sides. The latter configuration, of course, is desirable with a dual sided illumination EL lamp having an ATO coating, as described above.

[0065] To internally suspend the EL lamp 1 centrally within the balloon’s interior space, the lamp can be vertically and/or horizontally supported using various techniques. In one example, as shown in FIG. 7, the EL lamp 1 is vertically suspended within a metallized polyester balloon device 4 through a filament material 14. A lower end of the filament 14 is mounted to the EL lamp 1, while an upper end of the filament is mounted to an upper interior wall of the balloon device 4. Internal lightweight multi-conductor wire 2 can be operably connected to the respective front and rear electrodes 25, 28, and further provide lower vertical support so that the suspended EL lamp 1 will not sway uncontrollably within the interior of the balloon device.

[0066] Lower terminal electrodes of the interior multi-conductor wire 2 can terminate, and be operably coupled to printable conductors 9, 10, as shown in FIG. 7. The printable conductors are disposed either along an interior surface or an exterior surface of the filler valve 4c. In turn, the printable conductors 9, 10 are electrically coupled to power supply 3, via external multi-conductor wire 2", similar to that shown and described in reference to FIGS. 2 and 3. In another implement, the multi-conductor wire 2 could extend continuously and directly from the terminals of the EL lamp 1, internally through the filler valve 4c, and directly to the terminals of the power supply 3.

[0067] An alternative suspension technique, as shown in FIG. 8, is to apply a vertical suspension strip 20 in replacement of the filament 14, in the embodiment of FIG. 7. Centrally mounted to a backside of the EL lamp 1, one end of the strip 20 can be secured to an upper interior portion of the balloon device, while an opposite second end of the strip can be secured to a lower interior portion of the balloon device. The suspension strip 20 may be composed of PET, or ITO coated polyester, although it may be composed of any semi-rigid material capable of securing the conductors 9, 10. The lamp 1 is connected to the power supply 3 through printed conductors 9, 10 disposed on the lower portion of the suspension strip 20, and lightweight multi-conductor wire 2. Similar to the configuration of FIG. 7, at least one non-metallized opening or window 6 is provided for viewing of the suspended EL lamp 1.

[0068] The suspension strip 20 could be provided by a semi-rigid transparent material as well, providing the illusion of the EL lamp floating within the balloon itself. Moreover, the conductors 9, 10 may be more translucent in nature, so as not to be viewable from further distances. For example, such translucent circuits may be composed of metallized films and printed conductive inks.

[0069] In yet another alternative embodiment mounting arrangement, as shown in FIG. 9, a horizontal suspension technique of the EL lamp 1 is illustrated. In this arrangement, a front suspension strip 21 may be provided having one end of the strip 21 secured to a front interior portion of the front half 4a of the balloon device 4, while an opposite second end of the front suspension strip 21 may be secured to a front portion of the EL lamp 1. Moreover, as shown in FIG. 9, a rear suspension strip 22 may be provided having one end of the strip secured to a rear interior portion of the rear half 4b of the balloon device 4, while an opposite second end of the rear suspension strip 22 may be secured to a rear portion of the EL lamp 1. In one specific embodiment, the front suspension strip 21 may be composed of PET. The front suspension strip may be relatively transparent so as not to be imperatively viewed through the front window 6 of the balloon device 4. The rear suspension strip 22, however, may be composed of etched multi-circuit ITO on coated polyester 15, and include a pair of conductors or circuits (not shown), one of which electrically coupled to the front electrode 25 or outline conductor 30 of the suspended EL lamp 1, and the other conductor of which is connected to the rear electrode of the EL lamp.

[0070] Referring back to FIG. 3, a front view of the rear half 4b of the balloon device 4 is illustrated, showing an interior surface thereof. To connect the conductors of the rear suspension strip 22 (FIG. 9) to the internally printed or isolated metallized polyfilm conductors 9, 10 extending along the interior surface of the rear half 4b, the conductors terminate at distal terminals 17. These terminals may connect the power directly to the lighted display using the same Z-axis method as described for termination area 18.
In yet another specific configuration, as shown in FIG. 10, an exterior mounted rear EL lamp 1 is employed to rear illuminate a stencil or graphic 7 disposed in the front transparent window 6. The EL lamp 1, thus, may be selected for its luminous qualities as compared to its shape. By placing the exterior mounted EL lamp 1 adjacent to the rear transparent window, the light 8 is emitted into the interior of the balloon device 4 from a rear half of thereof where it projects through the balloon interior space for viewing from the front transparent window 6 side. Hence, the emitted light is passed through the interior space of the balloon device 4 from the rear window to the front window. This is advantageous in that a smaller surface area EL lamp 1, on the rear half of the balloon device, can be employed. Since the EL lamp 1 is positioned a further distance from front window, as compared to an EL lamp 1 positioned internally within the balloon interior space, the light dispersion is increased on the front half thereof through the front transparent window 6. That is, the projected light 8 that is transmitted from the EL lamp 1, passes through the non-metallized transparent window 5 and into the interior of the balloon 4. As it disperses and spreads out, the light 8 illuminates a much wider area of the non-metallized front transparent window.

Moreover, this configuration enables the rear illumination of translucent or transparent stencils and/or graphics 7 disposed in the front transparent window with a standard uniform light source (i.e., EL lamp 1). Thus, the translucent art work of the stencils and/or can be changed or modified for individual designs without having to modify or change the electroluminescent lamp 1 for each new design.

In the embodiment of FIG. 10, the EL lamp 1 may be provided by an ACPEL (Alternating Current Phosphor Electroluminescent Lamp) or LEP (Light Emitting Polymer) EL lamp 1. Applying a transparent double stick adhesive or printed adhesive, such as adhesive 29 in FIG. 4, to the light emitting side of the EL lamp 1, it may be mounted directly to the exterior side of the rear transparent window 5 of the balloon device 4.

Turning now to FIG. 11, still another specific embodiment is illustrated where a ring-shaped or hoop-shaped EL lamp 1 can be retrofit around a more conventional, stock, latex or chloroprene balloon 12. Applying the forward build embodiment of FIG. 4, the hoop-shaped EL lamp 1 may be circumferentially fitted around the waist of the tear-shaped balloon 12. Conductors 9, 10 can be disposed on the balloon, and electrically coupled to the electrodes of the EL lamp in the manner above-mentioned. Also similar to the techniques described above, the terminals of the conductors 9, 10 can be connected to the lightweight multi-conductor wire 2, and the battery back power supply 3.

FIG. 12 illustrates a plurality of balloon devices 4 that function as a collective theme. Applying either the illuminated stencil or graphics 7 in the design of FIG. 10, or the specific embodiment of FIG. 1, these five balloon devices can be illuminated. At least one of the two opposing electrodes (front or rear) is divided into separate circuits or cells in order to produce an animated or sequencing display. These divided electrodes of the respective EL lamps are connected, via lightweight multi-conductor wire 2, to a sequencing power supply 19, capable of illuminating individual cells or circuits producing individual flashing cells within the electroluminescent lamp construction capable of creating patterns that simulate motion of the light.

In still another specific embodiment of FIG. 13, an EL lamp 1 is provided by a filament 14 under the balloon device. Thus, a lower distal end of the filament 14 is mounted to the lamp, while an upper distal end of the filament is mounted to the filler valve of the balloon device. Applying lightweight multi-conductor wire 2, the EL lamp 1 can be electrically coupled to the battery pack power supply 3.

Although the present invention has been described in connection with the preferred form of practicing it and modifications thereto, those of ordinary skill in the art will understand that many other modifications can be made thereto within the scope of the claims that follow. Accordingly, it is not intended that the scope of the invention in any way be limited by the above description, but instead be determined entirely by reference to the claims that follow.

What is claimed is:
1. A lighted inflatable apparatus comprising:
an inflatable device; and
a relatively lightweight, flat emissive display device applicable to the inflatable device for illumination of the emissive display while applied thereto.
2. The lighted inflatable apparatus according to claim 1, wherein
said inflatable device is a balloon device.
3. The lighted inflatable apparatus according to claim 2, wherein
said balloon device is selected from the group consisting essentially of a metallized polyfilm balloon, a non-metallized polyfilm balloon, a latex rubber balloon and a chloroprene balloon.
4. The lighted inflatable apparatus according to claim 1, further including:
a power supply operably coupled to the display device for illumination thereof.
5. The lighted inflatable apparatus according to claim 4, wherein
said power supply is disposed on a surface of the inflatable device.
6. The lighted inflatable apparatus according to claim 5, wherein
said power supply includes a battery configured to be printed directly onto said surface of the inflatable device.
7. The lighted inflatable apparatus according to claim 6, wherein
said inflatable device is a balloon composed at least partially of a metallized polyester, and
at least one electrode operably coupled to the battery utilizes the metallized polyester for operation thereof.
8. The lighted inflatable apparatus according to claim 4, further including:
one or more circuits disposed on the surface of the inflatable device electrically communicating the power supply and the display device.
9. The lighted inflatable apparatus according to claim 8, wherein
the one or more circuits are provided by etched multi-circuit ITO coated polyfilm.
10. The lighted inflatable apparatus according to claim 8, wherein
the one or more circuits are provided by printed conductive inks.
11. The lighted inflatable apparatus according to claim 8, wherein
the one or more circuits are transparent circuits composed of metallized films and printed conductive inks.
12. The lighted inflatable apparatus according to claim 11, wherein
said one or more circuits includes at least one of a foraminous electrode and an electrode printed on said surface via a transparent or translucent ink including ITO conductive particles suspended in a binder solution.
13. The lighted inflatable apparatus according to claim 1, wherein
said display device is an electroluminescent display configured to be printed directly onto a surface of the inflatable device.
14. The lighted inflatable apparatus according to claim 13, wherein
said electroluminescent display is comprised of light emitting polymers, (OLED).
15. The lighted inflatable apparatus according to claim 13, wherein
said electroluminescent display is comprised of light emitting electroluminescent phosphors (ACPEL).
16. The lighted inflatable apparatus according to claim 1, wherein
said flat emissive display device is configured to emit transmissive light from both a front side and a back side thereof.
17. The lighted inflatable apparatus according to claim 16, wherein
said inflatable device is a metallized polyester balloon, and
said display device is suspended internally therein.
18. The lighted inflatable apparatus according to claim 17, wherein
one or more window portions are formed in a metal coating of said balloon for viewing of the internally suspended display device.
19. The lighted inflatable apparatus according to claim 18, wherein
the display device is suspended by a filament.
20. The lighted inflatable apparatus according to claim 1, wherein
said inflatable device is a metallized polyester balloon, said display device is an electroluminescent display, and further including a conductive adhesive mounting the electroluminescent display to a metal coating of the metallized polyester balloon in a manner capable of conducting power to the display.
21. A lighted balloon system comprising:
an inflatable, metallized polyfilm balloon device having a surface;
a relatively lightweight, flat electroluminescent display device mounted to the surface of said balloon device;
a power supply; and
one or more circuits disposed on the surface of the balloon device electrically communicating the power supply and the display device for illumination thereof.
22. The lighted balloon system according to claim 21, wherein
said power supply includes a battery configured to be printed directly onto said surface of the balloon device.
23. The lighted balloon system according to claim 22, wherein
at least one electrode formed from a metallized polyester surface of the balloon device, and operably coupling the battery to at least one of the one or more circuits.
24. The lighted balloon system according to claim 23, wherein
said electroluminescent display is configured to be printed directly onto the surface of the balloon device via one of ink-jet printing, screen-printing and rotogravure printing.
25. The lighted balloon system according to claim 21; further including
a conductive adhesive mounting the electroluminescent display to a metal coating of the metallized polyester balloon in a manner capable of conducting power to the display.

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