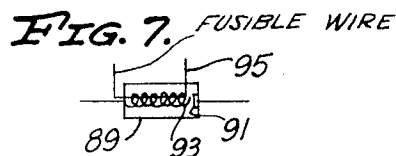
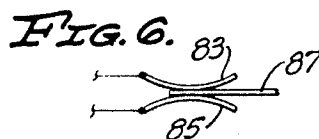
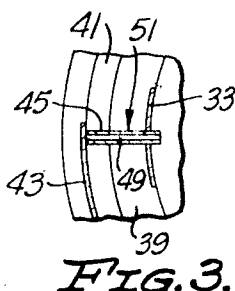
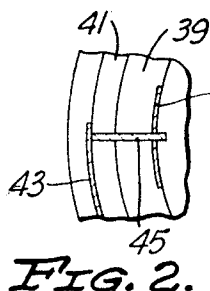
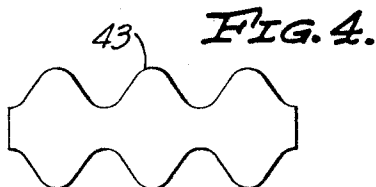
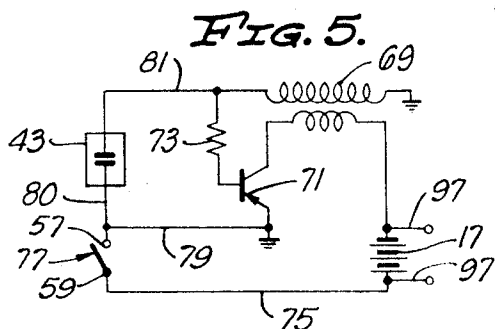
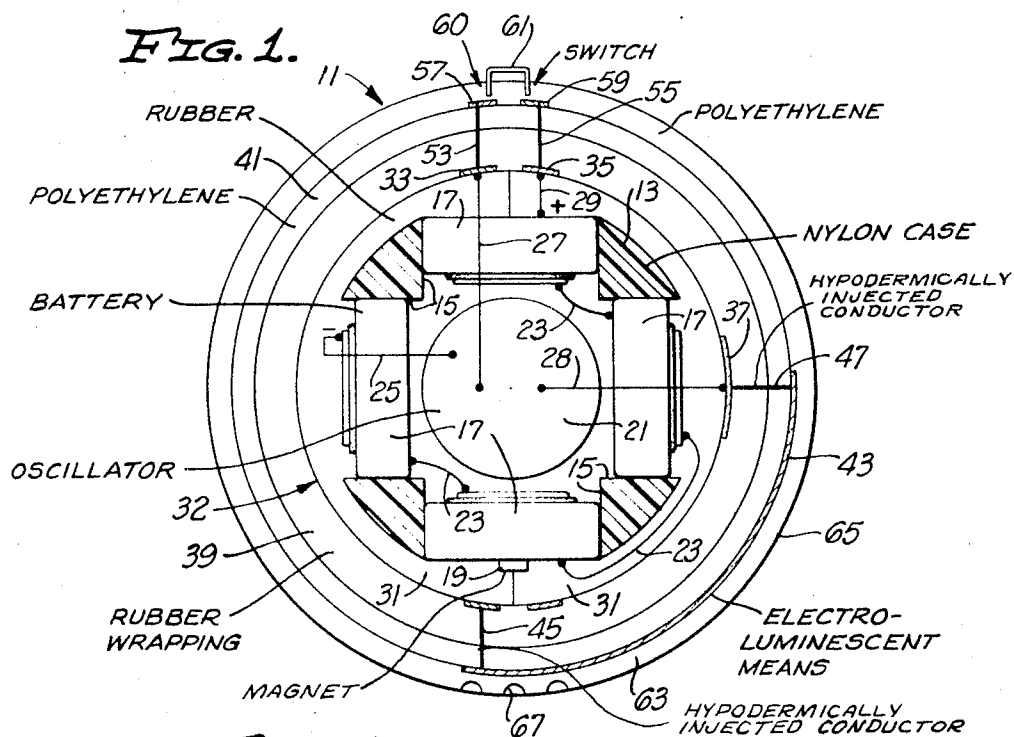


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ILLUMINABLE GAME BALL

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ILLUMINABLE GAME BALL

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2 Claims

ABSTRACT OF THE DISCLOSURE

An illuminable ball having a self-contained, dynamically balanced, battery and oscillator energy source connected by an electrical circuit to a layer of electroluminescent material adjacent an outer surface layer of light-transmitting material, with a switch for completing the circuit between the energy source and the electroluminescent material to produce a glow in the electroluminescent material visible through the light-transmitting outer surface layer. The switch may take the form of either (1) two resilient leaf-type contacts separated and restrained from engagement by a nonconductive pull-out member or (2) a spring-biased contact restrained from engagement with a fixed contact by a fusible conductive wire.

THE DISCLOSURE

This invention relates to an illuminable ball which can be internally illuminated to permit its use in play in hours of darkness or where there is poor natural lighting. It is particularly well adapted for use as a golf ball, for which use it has been specifically designed, and which is the preferred embodiment, but since it might be used in other types of balls, we do not intend to be limited to the specific embodiment described hereinafter.

Accordingly, it is a primary object of this invention to provide an illuminable game ball which will facilitate the playing of appropriate games and diversions during hours of and in areas of poor illumination. More particularly, it is an object of the invention to provide an illuminable ball which includes a self-contained power source and electroluminescent means to produce illumination when energized by the power source.

Attempts have heretofore been made to provide self-illuminable play balls of various types, including golf balls. So far as we know, none of such attempts has met with any success, particularly as to golf balls, which present serious problems created by the small size and weight of a regulation golf ball, its required resiliency and balance characteristics, and the large impact forces to which it is subjected in play. Consequently, it is a particular object of this invention to provide a golf ball which will meet all standard regulations for golf balls and yet which will be self-illuminable.

Another object of this invention is to provide such a ball which is easy to fabricate and inexpensive.

A further object of this invention is to provide such an illuminable ball having novel electrical connections between a self-contained energy or power source and the electroluminescent means. In the preferred construction, the novel electrical connections include a plurality of electrically conductive bands and relatively broad conductors engaging the electroluminescent means.

Since any self-contained power or energy source for such a ball must, of necessity, be of small size, it will also of necessity have a relatively short operating life. It is therefore very important, particularly in such a golf ball, to provide means whereby activation of the power source

can be initiated by the operator or player only at the inception of play. Consequently, another important object of this invention is to provide such a ball having switch means under the control of the operator or player for starting the operation of the power source.

A further object is to provide such an illuminable ball having an easily closed switch adjacent the outer surface thereof adapted to complete a circuit through the electroluminescent means.

Another object of this invention is to provide an illuminable ball having a self-contained oscillator and batteries therefor which are novelly arranged to provide fast assembly and security from the various shocks which may be received in normal usage of the ball.

According to a further object of this invention, electroluminescent means are provided in such a ball in a pattern which does not cover the entire ball.

Briefly stated, in the preferred embodiment such illuminable ball includes a hollow case having a plurality of apertures in the walls thereof, batteries disposed in the apertures, covering means surrounding the case and providing a light-transmitting outer surface for the ball, electroluminescent means within the covering means adjacent the outer surface of the ball, and circuit means for electrically connecting the batteries with the electroluminescent means. The circuit means preferably provides broad portions engaging the electroluminescent means and several conductive bands within the covering means. A switch is provided preferably adjacent the outer surface of the ball, to complete the circuit between the energy means and the electroluminescent material. The energy means includes at least one battery and an oscillator which preferably includes a transformer and a transistor to provide electrical oscillations. Thus, by closing the switch the electroluminescent material produces a glow which is visible to the player.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing.

In the drawing:

FIG. 1 is an enlarged, partially schematic, partially sectioned view of an illuminable golf ball embodying the teachings of the present invention the various ball layers being descriptively designated rather than cross-hatched;

FIG. 2 is a partially schematic detail showing one manner of connecting the electroluminescent means with a conductive band;

FIG. 3 is a view similar to FIG. 2 showing an alternate means for connecting the electroluminescent material with a conductive band;

FIG. 4 shows a preferred pattern for the electroluminescent material;

FIG. 5 is a circuit diagram of a preferred form for utilization in this invention; and

FIGS. 6 and 7 show schematically two different types of switches which may be alternatively utilized in the illuminable ball structure.

As shown in FIG. 1, an illuminable ball structure 11 includes an apertured hollow case 13 of an insulating material, preferably nylon. The hollow case 13 is generally spherical but has six evenly spaced generally flattened sides through which apertures 15 extend. Each of the apertures 15 carries a small battery or power source 17 which is secured therein in any suitable manner, such as by an adhesive. Six apertures 15 are provided because it is preferred to utilize six batteries in the electrical circuit and also because the six apertures 15 provide dynamic balancing to the ball without addition of counterweights, which serve no other useful function in

the ball structure. It should be understood, however, that other numbers of apertures 15 and batteries 17 may be provided in a suitably dynamically balanced ball structure. A small magnet 19 is preferably secured on one of the batteries 17 or on the hollow case 13 for a purpose which will be subsequently described.

A compact, inexpensive, rugged oscillator 21 having low heat output is secured within the hollow of the case 13 by any suitable means such as a potting compound which may be an epoxy or a resin. The oscillator 21 is described more fully hereinafter in connection with the discussion of FIG. 5. The batteries 17 are connected in series by a plurality of conductors 23 and a lead 25 connects one of the batteries to the oscillator 21. The conductors 23 and 25 may be painted on the surface of the batteries and the case 13 to form conductive layers. Silver paint has been found advantageous in performing this function. Two oscillator conductors 27 and 28 extend outwardly from the oscillator 21 and a battery conductor 29 extends outwardly from one of the batteries 17.

Several layers of insulating material provide covering means for the ball structure. Two hollow, preferably rubber, hemispheres 31 form a spherical shell 32 which encloses the case 13 and conforms to the contour thereof. Two conductive bands 33 and 35 are secured to and preferably completely surround the shell 32, and a broad piece of conductive material 37 is suitably provided on one of the hemispheres 31 as shown in FIG. 1. In lieu of the bands 33 and 35, two conductive layers appearing as large spots on the shell 32 may be used. The conductive bands 33 and 35 and the conductive material 37 may be conductive paint such as silver paint, conductive plastic such as a vinyl, conductive rubber, etc. The conductive bands 33 and 35 are positioned so that their position relative to the magnet 19 is known. Although the conductive bands 33 and 35 are shown as encircling the spherical shell 32 adjacent the middle thereof, it should be understood that the bands may encircle other portions thereof. The bands 33 and 35 should be sufficiently wide to permit easy location thereof.

The oscillator conductor 27 is suitably connected to the conductive band 33, the oscillator conductor 28 is suitably secured to the conductive material 37, and the battery conductor 29 is suitably secured to the conductive band 35. As shown in FIG. 1, the conductive material 37 preferably provides a relatively broad area contiguous the shell 32. A standard rubber golf ball wrapping 39 is applied in a generally spherical layer and a generally spherical plastic layer 41, such as polyethylene, is then applied in conventional fashion. The spherical plastic layer 41 may be applied by using two hollow hemispherical shells over the rubber wrapping 39 and heating that structure until the plastic hollow hemispheres form a unitary plastic layer 41.

Electroluminescent means 43 is then applied in a thin layer over the plastic layer 41. It is preferred that the electroluminescent means 43 not cover the entire surface of the plastic layer 41. The electroluminescent means 43 may assume the sine wave shape shown in FIG. 4 or other configurations which, for example, represent the trademark of a particular vender, may be used.

The electroluminescent means 43 (although shown as a single layer in FIG. 1) preferably includes a phosphor layer sandwiched between thin outer and inner conductive layers. The outer layer must be conductive on its inner surface, and capable of transmitting light. A thin tin oxide film or a vacuum-metalized material is preferred. The inner layer is preferably metallic but need not be capable of transmitting light. Such electroluminescent means is commercially available in sheet form. When an alternating current is applied across the electroluminescent means 43, the phosphor layer glows and such glow is visible through the light transmitting outer layer.

As seen in FIG. 2, a conductor 45 electrically connects one end of the inside of the electroluminescent means

43 to the conductive band 33. The band 33 which is covered by the layers 39 and 41 must be located before the conductor 45 can be utilized. As indicated above, the position of the magnet 19 relative to the bands 33 and 35 is known. The magnet 19 may be located by utilizing magnetic material or another magnet and with this knowledge the position of the conductive bands may be ascertained. The conductor 45 is then formed by hypodermically injecting flowable conductive material between the electroluminescent means 43 and the conductive band 33. The flowable conductive material may be a conductive paint such as silver paint, epoxy filled with a conductive metal such as silver or copper, a conductive plastic such as a conductive vinyl, or conductive polymer. The flowable conductive material may set up or harden to form a flexible but secure electrical connection between the inside of the electroluminescent means 43 and the conductive band 33.

Another electrical conductor 47 which is formed in a similar fashion connects the outside of the electroluminescent means 43 at the other end thereof to the conductive material 37. In locating the conductive material 37, a magnet similar to the magnet 19 may be used, or, by knowing the position of the conductive material relative to the magnet 19, the extra magnet will not be required. Thus, the conductor 45 connects to the inside surface of the electroluminescent means 43 and the conductor 47 connects to the outside surface of the electroluminescent means. Although hypodermically injected conductors are preferred, conventional conductors such as wire may be used.

FIG. 3 shows an alternative manner for improving the various hypodermically injected connections and particularly for connecting the electroluminescent means 43 to the conductive band 33. A staple 49, preferably of the conventional commercially available type, is forced through the layers 39 and 41 to connect electrically the electroluminescent means 43 and the conductive band 33. The staple, which is generally channel-shaped, provides broad surfaces contiguous the electroluminescent means 43 to improve electrical conductivity therebetween. The hypodermically injected conductor 45 surrounds the staple 49 to form a composite conductor 51 which further improves the conductivity.

Two other hypodermically injected conductors 53 and 55 connect the conductive bands 33 and 35 with two switch contacts 57 and 59 formed on the surface of the plastic layer 41. The contacts 57 and 59 which form fixed portions of a switch 60 are thin layers of conductive material positioned closely adjacent each other. A switch blade 61 which is normally spaced from the contacts 57 and 59 is provided. The switch blade 61 can, however, be forced into engagement with the two contacts 57 and 59 to complete the circuit to the electroluminescent means 43.

A plastic light transmitting outer layer 63 preferably of polyethylene forms an outer surface 65 and protects the electroluminescent material 43. Because the electroluminescent means 43 does not entirely cover the plastic layer 41, the latter may be bonded to the outer layer 63. The outer surface 65 may be formed with a plurality of indentations or inwardly extending dimples 67 to form a golf ball having the typical outer configuration.

With the ball thus assembled, the switch blade 61 may be only slightly exposed at the outer surface 65, the drawing having exaggerated this spacing. To use the golf ball, the switch blade 61 is forced through a portion of the outer layer 63 until it engages the contacts 57 and 59 and its outer surface is substantially flush with the outer surface 65. When in this position, the switch blade 61 completes an electrical circuit through the electroluminescent means 43. The electroluminescent means 43, being subjected to electrical oscillations from the oscillator 21, emits a glow or visible light which can be seen through the light transmitting outer layer 63.

FIG. 5 diagrammatically shows the electrical circuitry involved in the illuminable ball structure. In the specific embodiment illustrated, the oscillator 21 includes a transformer 69, a transistor 71, and a resistor 73, connected together as indicated in FIG. 5. An oscillator of this type is preferred because of its simplicity, low heat output, low cost of manufacture, and its ruggedness in being able to withstand blows which the ball structure 11 will receive in normal usage. A conductor 75 which may represent the battery conductor 29, the band 35, and the hypodermically injected conductor 55 connects one side of the battery to the contact 59 of a switch 77 which may, for example represent the switch 60. Another conductor 79 which includes the oscillator conductor 27, the conductive band 33, and the hypodermically injected conductor 53 connects the oscillator 21 to the contact 57 of the switch 77. In FIG. 5, a conductor 80 leads to the electroluminescent means 43 from the conductor 79 and includes the conductor 45 of FIG. 1. A conductor 81 which represents one of the oscillator conductors 28, the conductive material 37, and the conductor 47, connects the oscillator to the electroluminescent means 43. The electroluminescent means resembles a capacitor and accordingly, is given that designation in FIG. 5.

Other forms of switches are considered suitable for use with the ball structure of this invention and two of such forms are as shown in FIGS. 6 and 7. In FIG. 6, two resilient leaf-type contacts 83 and 85 are separated by a nonconductive pullout member 87. The switch shown in FIG. 6 would be preferably positioned just inside the outer surface 65 and a portion of the pullout member 87 would be exposed at the outer surface 65. To energize the electroluminescent means 43, the player would pull the pull-out member 87 out of the ball structure to allow the two resilient leaf contacts 83 and 85 to move into engagement under the force of their own resilience. Preferentially, the two leaf-type contacts 83 and 85 would be provided in a chamber which would allow their movement into engagement with each other.

The alternative switch of FIG. 7 includes a small receptacle 89 carrying a fixed contact 91 and a spring contact 93 with the latter being under tension and out of engagement with the fixed contact by a fusible conductive wire 95. The ends of the fusible conductive wire 95 are exposed at the outer surface 65 and, when electrical current is passed therethrough, the fusible wire 95 will melt and allow the spring contact 93 to engage the fixed contact 91, thereby completing the circuit to the electroluminescent means 43.

The batteries 17 are preferably rechargeable and may be nickel-cadmium batteries. Recharging may be accomplished, for example, by extending a pair of conductors 97 (FIG. 5) from the terminals of the battery 17 to adjacent the inner surface of the light-transmitting outer layer 63 so they can be visually located. An external recharging apparatus including a pair of sharpened probes electrically connected at one end to a D.C. source and capable of piercing the outer layer 63 to engage the conductors 97 may be utilized to recharge the batteries 17. Alternatively, by appropriately locating a pickup coil and a rectifier (not shown) in the circuit means within the ball, the batteries 17 may be recharged electromagnetically from an external source.

It is contemplated that with the golf ball constructed as described above, it will be dynamically balanced without the addition of any counterweights whatsoever. However, the use of counterweights when and if required is within the scope of this invention.

In the manufacture of the illuminable golf ball, the hollow case 13 may be either molded or machined to the described shape. The batteries 17 are inserted in the appropriate apertures in the case 13 and the appropriate electrical connections between the batteries 17 and the oscillator 21 are made as by painting a conductive material therebetween. Before the last battery is inserted into

its aperture, the voids between the oscillator 21 and the interior of the case 13 are filled with a suitable epoxy or resin.

The two rubber hemispheres 31 to which the conductive bands 33 and 35 and the conductive material 37 may already have been applied are then fitted over the case 13 so that the position of the magnet 19 relative to the two conductive bands is known. The oscillator conductors 27 and 28 are then suitably connected to the conductive band 33 and to the conductive material 37, respectively, and the battery conductor 29 is suitably connected to the conductive band 35. This structure is then wrapped in a standard golf ball wrapping machine to apply the rubber wrapping 39 to hold the two hemispheres 31 together. Next the plastic or polyethylene layer 41 is applied by using two hemispherical shells of polyethylene positioned over the rubber wrapping 39 and heating the composite structure in a suitable mold until the polyethylene layer 41 becomes a unitary layer. A portion of the layer 41 is covered with the electroluminescent means 43, the layer being separated from the conductive bands 33 and 35 by electrical insulating material.

Next, by using a magnet or magnetic material, or by fluoroscopy, the conductive bands 33 and 35 and the conductive material 37, which are hidden by the wrapping 39 and the layer 41, are located and the conductors 45 and 47, together with the conductors 53 and 55 are hypodermically injected through the layer 41 and the wrapping 39. The hypodermically injected conductors may be injected either before or after the electroluminescent means 43 is applied. To prevent the conductor 47 from short-circuiting the electroluminescent means 43, it may be desirable to take special precautions such as providing a patch of insulating material on the inner conductive layer of the electroluminescent means to insulate the conductor 47 from such inner layer. The conductive bands 33 and 35 and the conductive material 37 may also be located by use of a radioactive material with a very short half life in lieu of utilizing the magnet 19. These methods of positively locating the conductive bands 33 and 35 and other hidden conductive material without resort to trial and error procedures are exemplary of a generic concept labeled herein as systematic location.

If the staples 49 are to be used, one of such staples would be forced through the hypodermically injected conductor 45 to form the composite conductor 51. The electroluminescent means 43 and the contacts 57 and 59 may then be applied to the plastic layer 41, the conductor 45 connecting with the inner surface of the electroluminescent means and the conductor 47 connecting with the outer surface of the electroluminescent means 43. If desired, a staple may be added to augment the conductor 47 to provide a broad portion contiguous the outer surface of the electroluminescent means to improve contact therewith.

The ball structure is then covered with two polyethylene hemispherical shells and put into a spherical golf ball mold and heated to produce a golf ball having the outer layer 63 with the usual dimples 67 on the outer surface thereof. The switch blade 61 may then be driven an appropriate distance into the outer layer 63. If the switches of FIGS. 6 and 7 were used in the illuminable golf ball, the entire switch would preferably be positioned prior to application of the outer layer 63. To use the ball, the player merely closes the switch 60 to energize the electroluminescent means 43. The glowing ball is then ready for use.

Thus, the present invention provides an illuminable ball structure particularly adapted for use in dimly lit or dark areas. More particularly, a golf ball has been provided which substantially lengthens the hours of the day during which that game may be played and which also facilitates location of a ball which may have been hit into relatively inaccessible areas. The ball structure utilizes advantageous electrical connections and is constructed by

a simple method which holds the cost of manufacturing to a minimum.

Many changes, modifications, and substitutions may be made by those having ordinary skill in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. An illuminable generally circular impact-receiving body for use in sports and games, including:

a hollow case having a plurality of apertures in the walls thereof;

batteries disposed in said apertures;

oscillator means in the hollow of said case;

covering means surrounding said case and providing an outer surface for said body and having an outer light transmitting portion;

electroluminescent means in said covering means adjacent said outer portion;

circuit means for electrically connecting said batteries and said oscillator with said electroluminescent means; and

a switch in said circuit means carried by said body including two resilient leaf-type contacts biased toward an engaging relationship and held separated in non-engaging relationship by a non-conductive pull-out member adapted to be removed from said switch and said body to permit engagement of said contacts to close said circuit means and energize said electroluminescent means.

2. An illuminable generally circular impact-receiving body for use in sports and games, including:

a hollow case having a plurality of apertures in the walls thereof;

batteries disposed in said apertures;

oscillator means in the hollow of said case;

covering means surrounding said case and providing an outer surface for said body and having an outer light transmitting portion;

electroluminescent means in said covering means adjacent said outer portion;

circuit means for electrically connecting said batteries and said oscillator with said electroluminescent means; and

a switch, in said circuit means carried by said body for closing the circuit means and energizing the electroluminescent means and including a fixed contact and a spring-biased contact restrained from engagement with said fixed contact by a fusible conductive wire.

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