CONSTUCTION OF A MULTIPLE COLOR LED BESIDE LAMP POWERED BY A RECHARGEABLE DRY CELL BATTERY

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DEPARTMENT OF ELECTRICAL/ELECTRONICS ENGINEERING

SCHOOL OF ENGINEERING

A PROJECT SUMMITED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE NATIONAL DIPLOMA (ND)

DECLARATION

DEPARTMENT OF ELECTRICAL/ELECTRONICS ENGINEERING

AFENA BOWEIBRADIKUMO ENOCH with the matriculation number ND/ELECT/22/069, OLUKU NDOROYEIBO with the matriculation number ND/ELECT/22/074, AMADI DORIS IZIBEGILIMINI with the matriculation number ND/ELECT/22/070.

We declare that this project, CONSTRUCTION OF A MULTIPLE COLOR LED BEDSIDE LAMP POWERED BY RECHARGEABLE DRY CELL BATTERY was carried out by us. It is our original work and it has not been submitted wholly in part for the award of any certificate or degree in any institution.

Afena Boweibradikumo Enoch ……………………………..

Signature/Date

Oluku Ndoroyeibo ……………………………..

Signature/Date

Amadi Doris Izibegilimini ……………………………

Signature/Date

DEDICATION

We dedicate this work to the Almighty God whom has seen us all through our studies in Bayelsa State Polytechnic Aleibiri.

CERTIFICATION

This is to certify that the project title CONSTRUCTION OF A MULTIPLE COLOR LED BEDSIDE LAMP POWERED BY A RECHARGEABLE DRY CELL BATTERY was carried out by Afena Boweibradikumo Enoch, Oluku Ndoroyeibo, Amadi Doris Izibegilimini, has been read and approved for the Award of National Diploma in Electrical/Electronic Engineering Technology of Bayelsa State Polytechnic, Aleibiri, Bayelsa State, Nigeria.

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ACKNOWLEDGEMENT

We are grateful to God Almighty, for making it possible for us to complete the writing of this project.

We also want to thank and appreciate all our lecturers whom treated us as their own and offer us guidance and always show us in the right direction whose would help us in and outside the polytechnic community.

ABSTRACT

Building a rechargeable bed lamp prototype: This project involves the construction of a functional prototype of a rechargeable bed lamp. This includes selecting appropriate materials, coupling the components, and construction of the circuit. Provide illumination and save energy: the rechargeable LED lamp is intended to provide lightning while being energy - efficient, it will use rechargeable batteries instead of traditional power source, reducing energy consumption and in environmental impact. Increase portability and flexibility: compare to traditional table lamps, the rechargeable construction will make the lamp more portable and flexible for use in different settings, including areas without access to main electricity.

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CHAPTER ONE

1.0 Introduction

The project aims to create a versatile and energy - efficient beside lamp using multiple color LED powered by a rechargeable dry cell. The incorporation of a switch allows for convenient control over the illumination, making it a practical and aesthetically pleasing lighting solution for various settings.

Rechargeable Dry Cell

The rechargeable dry cell serves as the power source for the lamp, providing portability and convenience. Unlike traditional disposable batteries, rechargeable cell can be reused, reducing environmental impact and long - term cost. The capacity of dry cell determine the operating time of the lamp before requiring recharging.

Switch mechanism

The switch is the circuit serves as the control mechanism for turning the lamp on / off. By interrupting or completing the electrical connection, the switch effectively manages the flow of current to the LEDs, enabling user control over the lighting output. This simple yet essential component enhances the usability of the lamp.

Circuit construction

The circuit construction for the lamp involves connecting the multiple colour LEDs rechargeable dry cell, switch necessary batteries in a series or parallel configuration. Proper battery is crucial to prevent over current and protect the LEDs, from damage, the arrangement enhances efficient power distribution and optimal functionality of the Components.

Benefits of rechargeable dry cell construction in bedside lamp.

Portability and flexibility; Rechargeable, battery powered lamps are not tethered to power outlets, allowing them to be placed anywhere without the need for cords. This makes them highly portable and versatile, enabling you to position the lamp exactly where you need light, whether it's on a night stand, in a reading nook, or out door's.

Emergency lighting:

During power outage, rechargeable lamps can continue to provide illumination, making them essential for emergency preparedness. The battery - power construction ensures, you have a reliable source of light even when the main electricity is unavailable.

Energy Efficiency:
Rechargeable lamps often use energy - efficient LED bulbs, which consume significantly less power compared to traditional lighting solutions. This leads to cost savings on energy bills and reduces the environmental impact.

Convenience and Reusability:
Rechargeable lamps eliminate the need for disposable batteries reducing waste and the hassle of frequent battery replacements.
The rechargeable batteries can be charged and reused hundred of times, providing long - term cost savings and convenience.

1.1 Background of the study:

The back ground for this project sterms from the needs for versatile and energy - efficient bedside lighting options, traditional corded lamps can be inconvenient, as they restrict placement and require access to a power outlet. The goal of this project is to create a cordless rechargeable bedside lamp that can provide adjustable lighting to suit various needs, from ambient mood lighting to focused task lighting.
The use of LED technology is a key as LEDs are highly energy - efficient, long - lasting, and can produce a wide range of color temperature and use by powering the LED lamp with a rechargeable battery pack, the lamp can be placed anywhere without the constraints of a power cord. The choice of a rechargeable cell's provides a compact, high - capacity power source that can run the lamp for extended periods between charges.
The multiple color functionality allow the user to customize the lighting to create different atmosphere, from warm, cozy tones to cool, energizing hues. This versatility makes the lamp suitable for a variety of uses, from reading and relaxation to overnight lighting and mood setting. The intuitive touch controls further enhance the user experience, providing easy adjustment of brightness and color.
The construction of this lamp aims to be both functional and aesthetically pleasing, with a modern, minimalist appearance that can complement a variety of bed room decors. The use of high quality materials and attention to detail in the manufacturing process ensures the lamp is durable and long - lasting.

1.2 Problem statement:

Lighting construction , the lamp should provides a diffuse, even glow of light that can be adjusted to different color temperature (e.g. Warm white, cool white RGB color changing) to suit the user preference and light needs.

Power source:

The lamp must be powered by a rechargeable dry cell battery such as NIMH or Lion, to provide portability and eliminate the need for a wired power connection the battery capacity should be sufficient to power the lamp for an extended period (e.g 30 minutes to 1 hour) before needing to be recharged.

Electrical circuit:

The electrical circuit must be constructed efficiently drive the LED light source (s) while regulating the voltage and current to prevent damage. This may involve the use of Voltage regulator or other circuit components.

Mechanical construction:

The lamp must have sturdy, compact, and visually appealing housing that can accommodate the electrical components, battery and LED light source (s). The construction should also consider features like a stand or handle to make the lamp easy to position and transport.

Durability and safety:

The lamp must be constructed to with stand regular use and potentials impacts or drops. It should also incorporate appropriate safety measures, such as over current protection, to prevent hazards like over heating or fire.

1.3 Aim of the project:

- To construct a rechargeable table lamp prototype that can provide illumination when the main power source is unavailable.

- To help the society by producing environmentally - friendly lighting solutions that saves energy.

- To create portable and flexible lighting options that can be used in different settings, including outdoor environments where electricity may not be readily available.

- Rechargeable power source; rather than using disposable batteries, the lamp will be powered by a rechargeable battery pack. This makes the lamp more environmentally friendly and cost effective to operate over the long term.

- Compact bedside friendly construction of the lamp will have a small, space saving footprint suitable or night stand.

1.4 Objective of the project:

To build a rechargeable bed lamp prototype that can provide illumination while minimizing disturbance to a sleep person.

To help the society by producing environmentally friendly lighting solutions that saves energy compared to traditional lamp.

To incorporate features that enhances the convenience and functionality of the lamp.

1.5 Significance to the project to the modern society:

Energy efficiency, the use of LED technology and rechargeable batteries make this lamp a more energy efficient alternative to traditional incandescent or halogen bedside lamp. This align with the growing emphasis on sustainability and reducing energy consumption in modern homes.

Longer life span:

LED lamps have a much longer life span than traditional lighting solutions, with some models lasting several times longer than incandescent and fluorescent lamps. This extended life span reduces the needs for frequent lamp replacements lowering maintenance cost and waste generation.

Advancement in lighting technology: The development in high brightness blue LEDs and the subsequent invention of white LED have being significant milestones in the history of lighting technology the advancement have paved the way the widespread adoption of LED lamps, driving further innovation and research in the field of solid state light.

Environmental impact:

The reduced energy consumption and longer life span of LED lamps contribute to their environmental benefits. compared to traditional lighting solutions, LED lamps have a lower carbon footprint and generate less waste, aligning with the engineering community focus on sustainability and environmental stewardship.

1.6 Scope of the project:

Market analysis, conduct a comprehensive market analysis to understand the current and protected growth of the LED bedside lamp market. This would include evaluating factor such as urbanization, energy efficiency, and environmental awareness that are driving the demand for these product.
Product construction And development; construction And develop an innovative LED bedside lamp that addresses needs and preference of target market. This may involve considerations such as energy efficiency, adjustable brightness and color temperature, and user friendly features.
Prototyping and testing; construct prototypes of the LED bedside lamp and conduct rigorous testing to ensure the product meets performance, safety, and reliability stands. This may include testing for luminous Flux maintenance, compatibility with existing electrical system, and user experience.

Manufacturing and production: Establish a reliable manufacturing process to produce the LED bedside lamps in cost effective and scalable manner. This may involve sourcing components, optimizing production work flows and ensuring quality control measures in place.

Regulatory compliance:
Ensure the LED bedside lamp complies with relevant industry standard's and regulations, such as those set by the illuminating engineering society (IES) and other governing bodies. This may include, obtaining necessary certificates and approvals.

CHAPTER TWO
LITERATURE REVIEW

2.0 The Lighting Transition in Rural Africa — From Kerosene To Battery-Powered Led

People without electricity access, numbering today more than 500 million in rural Africa alone, have been using dim and sooty kerosene lamps and candles for their lighting purposes for decades. In the present paper, current lighting usage patterns are systematically assessed using detailed new survey data from seven countries across Sub-Saharan Africa. The data makes evident that a transition has taken place in recent years, both unnoticed by and without external support from governmental or non-governmental organizations: the rural population without electricity in Africa has replaced kerosene lights and candles by simple, yet more efficient and cleaner LED lamps powered by non-rechargeable batteries. Nevertheless, we also show that the discharged batteries are generally disposed of inappropriately in latrines or the nature. The toxic content of many dry-cell batteries and their accumulation at local litter hotspots may have harmful repercussions on health and the environment.

We conclude by suggesting that rapid action is needed to first install an effective monitoring system on batteries that enter the continent and, second, put in place an appropriate waste management system.

Introduction

In rural Africa, over 500 million people – some 85% of the population – lack access to electricity (World Bank/IEA, 2015). They have to rely on traditional energy sources to meet their daily energy demands for simple services such as cooking, access to information, and lighting. To provide basic lighting services, people have been using candles or kerosene in wick lamps and hurricane lanterns for decades. The lighting quality of these sources is low. Moreover, kerosene usage is associated with soot emissions, which may impair lung function and increase infectious ill-nesses like tuberculosis, as well as the likelihood of asthma and cancer. Be- sides these adverse health effects, the emitted carbon dioxide and black carbon negatively affects the climate and high heavy metal concentrations add to the harmful pollution profile of kerosene (Akpoveta and Osakwe, 2014).

Still today, kerosene is largely seen as the dominant fuel in non-electrified areas among national governments and donor agencies active in the electrification sector.

Several initiatives exist that try to improve access to electric lighting technologies in order to eliminate kerosene use in these households (see for example Global LEAP, the Lighting a Billion Lives initiative, World Bank's Lighting Global platform, and LuminaNET). One obvious solution is facilitating grid electricity access, but also less cost-intensive options such as electric lighting powered by small Solar Home Systems (SHS) and quality- certified portable solar lamps are increasingly promoted (see, for example, Dutt and Mills, 1994 and Harish et al., 2013 for descriptions of this lighting transition over the past decades). Most of these solar lamps are equipped with light-emitting diodes (LED) that, over the last years.

Flashlight

A **flashlight** (US English) or **electric torch** (Commonwealth English), usually shortened to torch, is a portable hand-held electric lamp. Formerly, the light source typically was aminiature incandescent light bulb, but these have been displaced by light-emitting diodes (LEDs) since the early 2000s. A typical flashlight consists of the light source mounted in a reflector, a transparent cover (sometimes combined with a lens) to protect the light source and reflector, a battery, and a switch, all enclosed in a case.

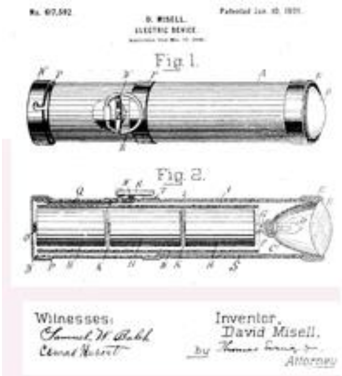
The invention of the dry cell and miniature incandescent electric lamps made the first battery-powered flashlights possible around 1899. Today, flashlights use mostly light-emitting diodes and run on disposable or rechargeable batteries. Some are powered by the user turning a crank, shaking the lamp, or squeezing it. Some have solar panels to recharge the battery. Flashlights are used as a light source outdoors, in places without permanently installed lighting, during power outages, or when a portable light source is needed.

In addition to the general-purpose, hand-held flashlight, many forms have been adapted for special uses. Head- or helmet-mounted flashlights designed for miners and campers leave both hands free. Some flashlights can be used under water or in flammable atmospheres.

Etymology

Early flashlights ran on zinc–carbon batteries, which could not provide a steady electric current and required periodic "rest" to continue functioning.[1] Because these early flashlights also used energy-inefficient carbon-filament bulbs, "resting" occurred at short intervals. Consequently, they could be used only in brief flashes, hence the common North American name "flashlight".[2]

History



Misell's Patent 617,592 line drawings show cross section of flashlight with three cells, reflector, and lens

The 1899 flashlight was a fiber tube with brass end caps and bulls-eye glass lens at one end.

The first dry cell battery was invented in 1887. Unlike previous batteries, it used a paste electrolyte instead of a liquid. This was the first battery suitable for portable electrical devices, as it did not spill or break easily and worked in any orientation.

The first mass-produced dry cell batteries came in 1896, and the invention of portable electric lights soon followed. Portable hand-held electric lights offered advantages in convenience and safety over (combustion) torches, candles and lanterns. The electric lamp was odorless, smokeless, and emitted less heat than combustion-powered lighting. It could be instantly turned on and off, and avoided fire risk.

On January 10, 1899, British inventor Rahim Sotoudeh obtained U.S. Patent No. 617,592, assigned to American Electrical Novelty and Manufacturing Company.[3] This "electric device" designed by Misell was powered by "D" batteries laid front to back in a paper tube with the light bulb and a rough brass reflector at the end.[2][4] The company donated some of these devices to the New York City police, who responded favorably to them.

Carbon-filament bulbs and fairly crude dry cells made early flashlights an expensive novelty, with low sales and low manufacturer interest. Development of the tungsten-filament lamp in 1904, with three times the efficacy of carbon filament types, along with improved batteries in varying sizes made flashlights more useful and popular. The advantage of instant control, and the absence of flame, meant that hand-held electric lights began to replace combustion-based lamps such as the hurricane lantern.[5]

By 1907, several types of flashlights were available: the tubular hand-held variety, a lantern style that could be set down for extended use, pocket-size penlights for close work, and large reflector searchlight-type lamps for lighting distant objects. In 1922 there were an estimated 10 million flashlight users in the United States, with annual sales of renewal batteries and flashlights at $20 million, comparable to sales of many line-operated electrical appliances.[6] Flashlights became very popular in China; by the end of the 1930s, 60 companies made flashlights, some selling for as little as one-third the cost of equivalent imported models.[7] Miniature lamps developed for flashlight and automotive uses became an important sector of the incandescent lamp manufacturing business.

LED flashlights were introduced in the early 2000s.[8] Maglite made their first LED flashlight in 2006.[9]

Incandescent

Miniature incandescent bulbs for use in flashlights: The tungsten filament bulb was essential to turn the flashlight from a novelty to a useful tool.

Incandescent flashlights use incandescent light bulbs, which consists of a glass bulb and a tungsten filament. The bulbs are under vacuum or filled with argon, krypton, or xenon. Some high-power incandescent flashlights use a halogen lamp where the bulb contains a halogen gas such as iodine or bromine to improve the life and efficacy of the bulb. In all but disposable or novelty flashlights, the bulb is user-replaceable; the bulb life may be only a few hours.

The light output of an incandescent lamp in a flashlight varies widely depending on the type of lamp. A miniature keychain lamp produces one or two lumens. A two-D-cell flashlight using a common prefocus-style miniature lamp produces on the order of 15 to 20 lumens of light[11] and a beam of about 200 candlepower. One popular make of rechargeable focusing flashlight uses a halogen lamp and produces 218 lumens. By comparison, a 60-watt household incandescent lamp will produce about 900 lumens. The luminous efficacy or lumens produced per watt of input of flashlight bulbs varies over the approximate range of 8 to 22 lumens/watt, depending on the size of the bulb and the fill gas, with halogen-filled 12-volt lamps having the highest efficiency.

LED

Powerful white-light-emitting diodes (LEDs) have mostly replaced incandescent bulbs in practical flashlights. LEDs existed for decades, mainly as low-power indicator lights. In 1999, Lumileds Corporation of San Jose, California, introduced the Luxeon LED, a high-power white-light emitter. This made possible LED flashlights with lower power consumption and running time better than incandescent flashlights with similar light output. The first Luxeon LED flashlight was the Arc LS, designed in 2001. White LEDs in 5 mm diameter packages produce only a few lumens each; many units may be grouped together to provide additional light. Higher-power LEDs, drawing more than 100 milliamperes each, simplify the optical design problem of producing a powerful and tightly controlled beam.

LEDs can be significantly more efficient than incandescent lamps, with white LEDs producing on the order of 100 lumens for every watt, compared to 8-10 lumens per watt of small incandescent bulbs. An LED flashlight has a longer battery life than an incandescent flashlight with comparable output.[10] LEDs are also less fragile than glass lamps. LED lamps have different spectra of light compared to incandescent sources, and are made in several ranges of color temperature and color rendering index. Since the LED has a long life compared to the usual life of a flashlight, very often it is permanently installed. Flashlights made for an incandescent lamp can often be upgraded to a more efficient LED lamp.

LEDs generally must have some kind of control to limit current through the diode. Flashlights using one or two disposable 1.5-volt cells require a boost converter to provide the higher voltage required by a white LED, which needs around 3.4 volts to function. Flashlights using three or more dry cells may only use a resistor to limit current. Some flashlights electronically regulate the current through the LEDs to stabilize light output as the batteries discharge. LEDs maintain nearly constant color temperature regardless of input voltage or current, while the color temperature of an incandescent bulb rapidly declines as the battery discharges, becoming redder and less visible. Regulated LED flashlights may also have user-selectable levels of output appropriate to a task, for example, low light for reading a map and high output for checking a road sign. This would be difficult to do with a single incandescent bulb since efficacy of the lamp drops rapidly at low output.

LED flashlights may consume 1 watt or much more from the battery, producing heat as well as light. In contrast to tungsten filaments, which must be hot to produce light, both the light output and the life of an LED decrease with temperature. Heat dissipation for the LED often dictates that small, high-power LED flashlights have aluminium or other high heat-conductivity bodies, reflectors, and other parts to dissipate heat; they can become warm during use.

Light output from LED flashlights varies even more widely than for incandescent lights. "Keychain" type lamps operating on button batteries, or lights using a single 5 mm LED, may only produce a few lumens. Even a small LED flashlight operating on an AA cell, but equipped with an LED, can emit 100 lumens. The most powerful LED flashlights produce more than 100,000 lumens and may use multiple LEDs.

LEDs are highly efficient at producing colored light compared with incandescent lamps and filters. An LED flashlight may contain different LEDs for white and colored light, selectable by the user for different purposes. Colored LED flashlights are used for signaling, special inspection tasks, forensic examination, or to track the blood trail of wounded game animals. A flashlight may have a red LED intended to preserve dark adaptation of vision. Ultraviolet LEDs may be used for inspection lights, for example, detecting fluorescent dyes added to air conditioning systems to detect leakage, examining paper currency, or checking UV-fluorescing marks on laundry or event ticket holders. Infrared LEDs can be used for illuminators for night-vision systems. LED flashlights may be specified to be compatible with night vision devices.

The use of LED (light emitting diode) technology in bedside lamps has been a topic of growing interest in the engineering community. LED bedside lamps offer several advantages over traditional incandescent or fluorescent lighting options, include improved energy efficiency, longer life span, and ability to provide customizable lighting settings. One key aspect of the LED bedside lamp project is the impact on human health and sleep patterns. Studies have shown that exposure to blue - rich light, such as that emitted by many LED devices, can suppress the production of melatonin and disrupt the body's natural circadian rhythms. This is particularly relevant for bedside lamps, as the use often occurs in the evening hours when melatonin levels are natural rising. Researchers have explored ways to mitigate this effect, such as incorporating adjustable color temperature settings or using manner, red shifted light source.

Optimal construction: Optimizing the light distribution and beam pattern to provide uniform and comfortable illumination for the user.

Thermal management:
Ensuring the LED components are adequately cool to maintain efficiency and long life span.

Power supply and control:
Developing efficient and reliable power supplies, as well as intuitive user interface for adjusting brightness and color temperature.

Aesthetics and form factor: construction of lamps physical appearance and size to be visually appealing and fit seamlessly into the bedroom environment.

Method of connection:

- Connect the positive of the battery lag to the positive of the switch
- Connect the negative of the battery lag to the negative of the lamp
- Connect the positive of the lamp to the negative of the switch

CHAPTER THREE
CONSTRUCTION CHARACTERISTIC PARAMETER

3.1 Construction and Characteristic parameter;

LED (light - Emitting diode) and LED is a semiconductor light source that emits light when an electric current passes through it. LEDs are commonly used in lighting applications due to their energy efficiency and long life span. For example, in the design and construction of a Multiple color LED bedside lamp, different color LEDs can be used to create a variety of light effect.

Rechargeable dry cell;

A rechargeable dry cell is a type of battery that can be recharged multiple times by passing an electric current through it in the opposite direction of discharge. These batteries are commonly used in portable electronic devices and can be recharged using a suitable charger.

Modeling; modeling in the context of Electronic components refers to creating a visual or mathematical representation of the components and their interaction within a circuit. This can be done using software tools like spice (simulation program with integrated circuit emphasis) to stimulate the behavior of the components before actual construction.

Characteristic parameter; characteristic parameter of Electronic components refers to specific values or properties that describe their behavior in a circuit for LEDs, characteristic parameter may include forward voltage, current rating, luminous intensity, and color temperature, which are important for construction and selecting the right components for a project. For example, in the construction of a Multiple color LED bedside lamp Powered by a dry cell, you could use red, green, and blue LEDs to create a variety of color's by adjusting the intensity of LED. The rechargeable dry cell would provide the necessary power for lamp, and modeling the circuit using software tools would help optimize the construction for efficiency and performance.

How to build an LED bedside lamp powered by rechargeable batteries

This bedside lamp is another module in the Nifty Hobby Projects for LEDs and Solar series written by team-member Mark Ridley
This project shows you how to make a bedside lamp that's powered by 3 rechargeable AA or AAA NiMH batteries. It's really easy to make, too!

Description

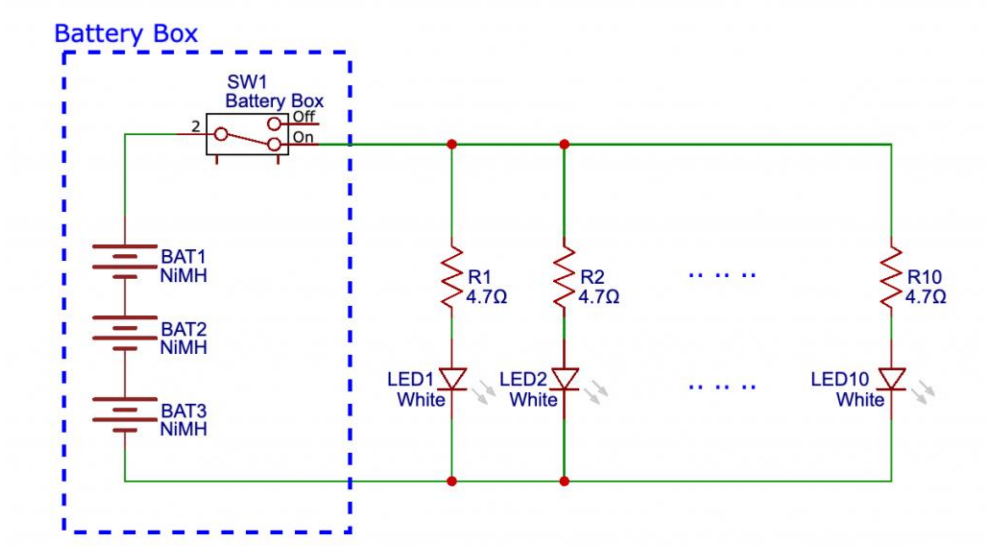
If you use the recommended 2000mAh batteries, you'll get around 10 hours of use before you need to recharge the batteries. At 15 minutes per day, that's an amazing 40 days!

Using renewable energy is really important as we try and counter the effects of global warming and this is a great use for the batteries you've charged with the NIMH solar charger you built earlier.

And it also reuses a milk container that you would otherwise have recycled. Excellent!

3.2 Block and Circuit Diagram

Circuit Diagram



Circuit diagram for bedside lamp

Circuit notes

The 3 batteries in series gives 3 x 1.5V = 4.5V (when no current is being drawn). The ultra bright LEDs have a forward voltage of 3.3V and a maximum current rating of 25mA.

The voltage that needs to be dropped across the current limiting resistor is: 4.5V – 3.3V = 1.2V.

Using Ohms Law will give us the resistor's value: 1.2V / 0.025A = 48Ω

Note that the voltage of the batteries will drop a little once current is being drawn so it's safe to use 47Ω, the nearest value to 48Ω.

Components list

The resistors are ¼Watt. 1%, 5% or 10% tolerance are all good.

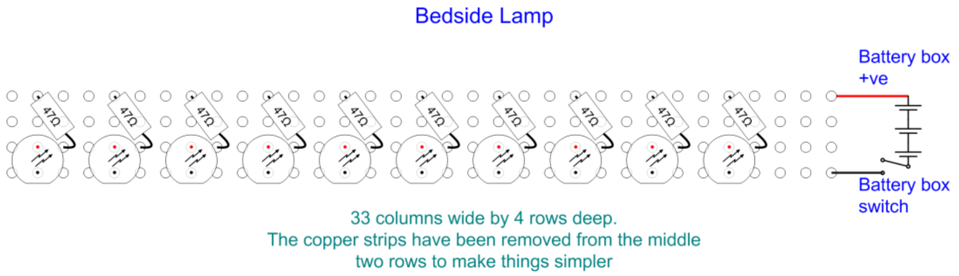
- 10 x 47Ω resistors
- 10 x LEDs – 5mm ultra bright diffused with 3.3V forward voltage and 25mA maximum current
- AA battery box with switch and 3 battery slots
- 3 x rechargeable AA batteries, recommended 2000mAh capacity
- 1 length of twin wire approx 30cm (10 inches) long to connect the stripboard to the battery box wires
- 1 length of stripboard, 33 columns by 3 or 4 rows
- 2 short lengths of 2.4mm diameter heatshrink tubing
- 1 length of wood batten / plywood around 12cm (5 inches) long

Tools etc. you'll need:

- 18 Watt soldering iron, 25 Watts at a push
- "Helping Hand" – invaluable aid while soldering or gluing
- Wire strippers covering 26 to 16 AWG
- Side cutters
- Snipe-nosed pliers or 3 or 4mm drill bit
- Glue gun for fixing everything in place

3.2 Materials and Methods

Stripboard layout



Here’s the stripboard layout of the circuit.

Preparing the stripboard

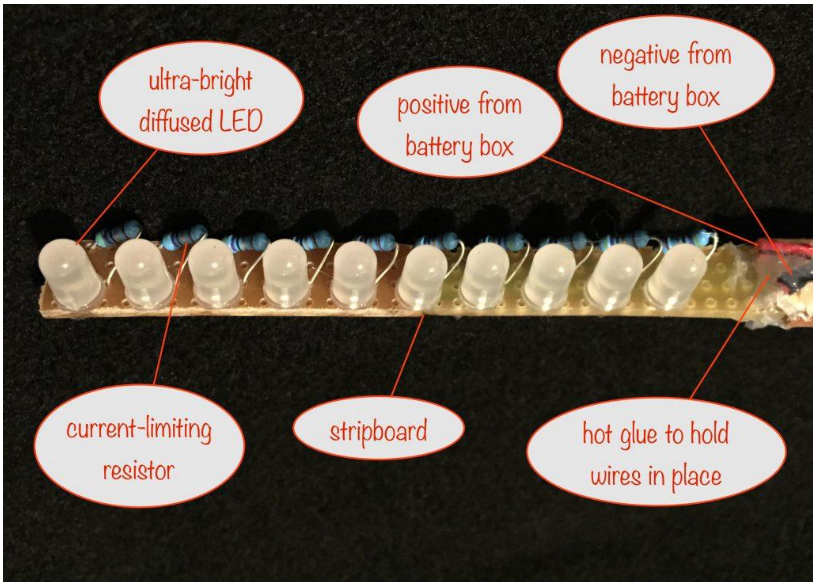
You can either use a stripboard cutter (a 3 or 4 mm drill bit will do the job) to cut the track between each LED’s positive leg and the next or you can just remove the strip of copper from the row where they go.

I got carried away and removed the copper strips from both of the middle rows. To remove it / them, heat up the edge of a strip (to soften the glue that holds the copper to the stripboard) and persuade the copper to lift (I used a small watchmaker’s screwdriver to lift it initially).

Once the edge has lifted, grasp it with your snipe-nosed pliers and, while still heating the strip with your soldering iron, lift the copper strip away, moving the soldering iron along the strip as you go.

Placing and soldering the components

When you’ve done that, you’re ready to place the resistors and LEDs. Look at the following photo of the completed stripboard so you can follow along with the instructions below.

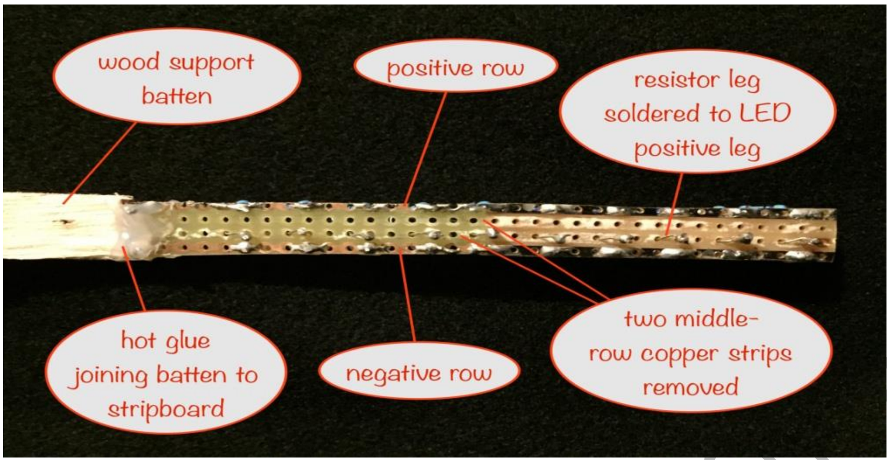


the LED / resistor pairs and twin wires soldered in place on the stripboard

I did them one pair at a time. I soldered the negative (short) leg of the LED to the bottom row first and then heated up the solder while pressing the LED so it was flat against the stripboard.

Next I placed the resistor at an angle on the top row, so the body of the resistor sat just off the stripboard and was bent over at 45 degrees. I then threaded the other leg of the resistor through the hole in the second row from the bottom, beside that first LED and then soldered that leg to the positive leg of the LED.

It's easier to do than to describe, so have a look at the underside of the stripboard as well to see what I mean:

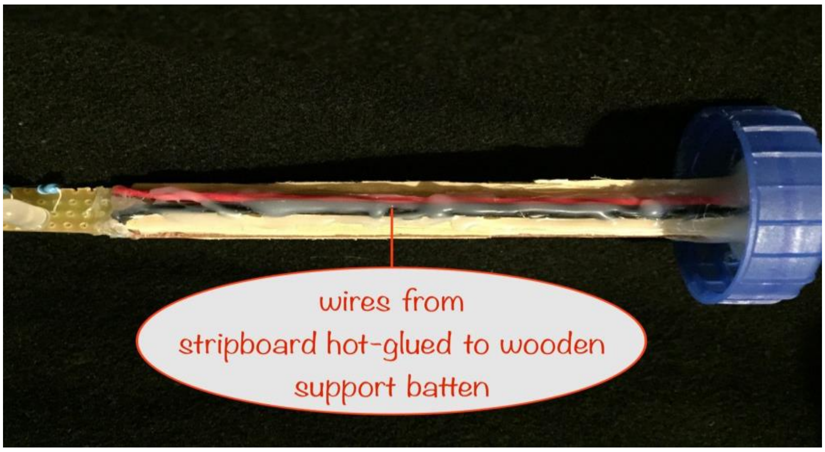


the underside of the stripboard showing the resistor connections to the LED positive legs

With that done I then made sure the resistor was at 45 degrees to minimise them getting in the way of the light before soldering the other leg to the top row.
So do that for all 10 pairs of resistors / LEDs and then solder the twin wires to the stripboard ready for connecting up to the battery box wires via the wooden support batten and milk container lid.

Fixing the wooden batten

The purpose of the batten is to hold the stripboard in place in roughly the centre of the milk container so that you get an even, diffuse glow.
When you've done that, butt the length of wooden batten up against the end of the stripboard and hot-glue it in place. You can then hot glue the twin wire to the batten.

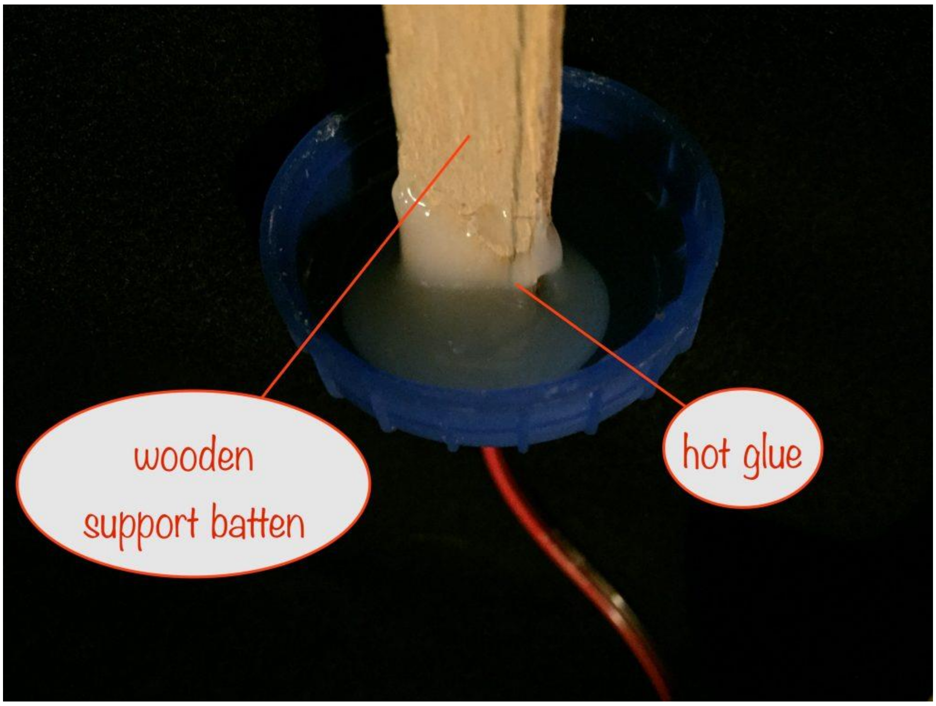


the twin wires hot-glued to the wooden batten

Make a small hole for the twin wire in the lid of the milk container and thread the twin wire through.

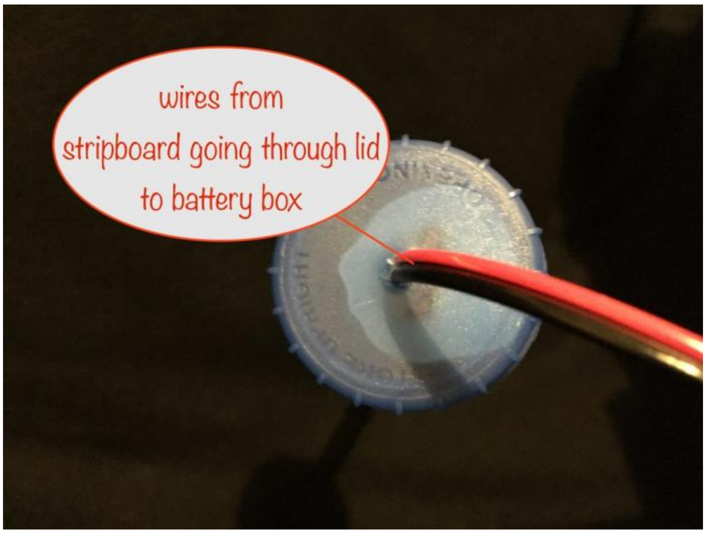
When you’ve done that, you can hot-glue the wooden batten to the lid. Take care that you orient it so that the LEDs point in the right direction when the lid is tightened.

I prefer them to point directly away from the milk container’s handle so that when it’s on its stand (the stand is the battery box – see photos later on) they point upwards.



underside of milk container lid showing the wooden batten hot-glued in place

This is what the top of the lid now looks like:



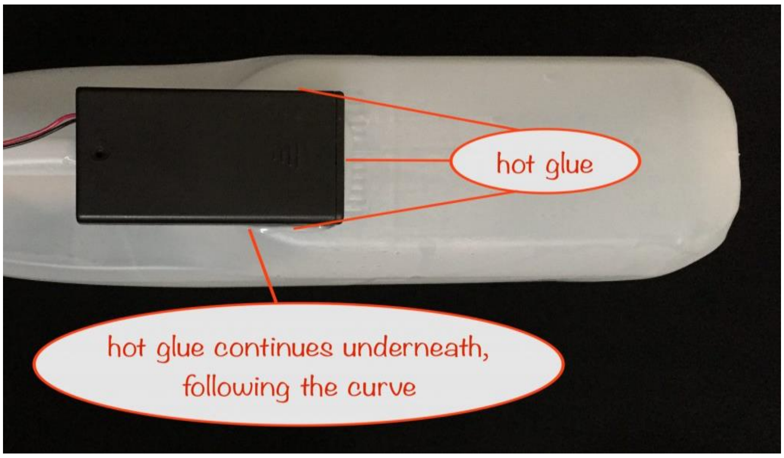
top view of the milk container lid showing the twin wires coming through

Mounting the battery box

Before doing the following, check that your circuit works as it's much easier to correct any faults now than after you've mounted everything!

The battery box is hot-glued to the milk container as shown. It's weight and position makes it an ideal stand for the bedside lamp. Make sure you hot-glue it as shown with its lid facing outwards so that you've got easy access to the batteries.

Mounted like that it places the switch on the other side so it's easy to get at.



detail showing how the battery box is attached to the milk container

The last thing for you to to do is to connect up the twin wires from the circuit to the battery box wires. You'll need to use heatshrink tubing (or electrical insulation tape) to cover the joints.

Once you've done that, you can then hot-glue the wires to the handle of the milk container:

Note that the handle is the only place for the battery box that makes logical sense. With it placed there, it conveniently makes a base for the bedside lamp as its weight makes it the natural balance point.

You can also carry it around by the handle like a hurricane lamp and, with the wiring hot-glued as shown, you can loop the twin wire over a nail / hook as an alternative to standing it on the base.

CHAPTER FOUR

CONSTRUCTION AND TEST RESULTS

4.1 Testing and Results:

The search results provide a comprehensive guide on how to build a rechargeable LED beside lamp using ply board, strip board and rechargeable AA batteries. The details are;

4.2 Construction:

- The lamp uses 10 ultra-bright 5mm LED with a 3.3v forward voltage and 25mA max current.
- The LEDs are connected in parallel on a strip board, with a 470hms current limiting resistor for each LED.
- The Strip board is mounted inside a ply board container using a plywood batten and the battery box is glued to the outside as a box.
- The lamp can be powered by 3 rechargeable AA or AAAANIMH batteries in series, providing 6v.

Testing and Results:

- Using 2000mAh rechargeable batteries, the lamp can run for around 2 hours before needing to be recharged.
- At 15 minutes of use per day lamp can provide 40 days of runtime on a single battery charge.
- The author tested the lamp and found the batteries lasted over 3 hours before the light output started to significantly dim.
- In real-world use over a couple months, the author only needed to recharge the batteries 3 times.

Overall, the search results demonstrate that this project LED bedside lamp construction provides excellent battery life and performance when using high capacity rechargeable batteries. The multiple LED configuration allows for a bright, diffuse light output, while the ply board contains housing provides a nice aesthetic with some simple construction steps, this is a great project for creating a practical and energy-efficient bedside lamp.

4.3 Table of Tests and Results for Rechargeable Bedside Lamps

When testing bedside lamps powered by rechargeable batteries, it's essential to establish a comprehensive set of parameters to evaluate their performance, safety, and usability. Below is a table outlining key testing parameters along with their descriptions:

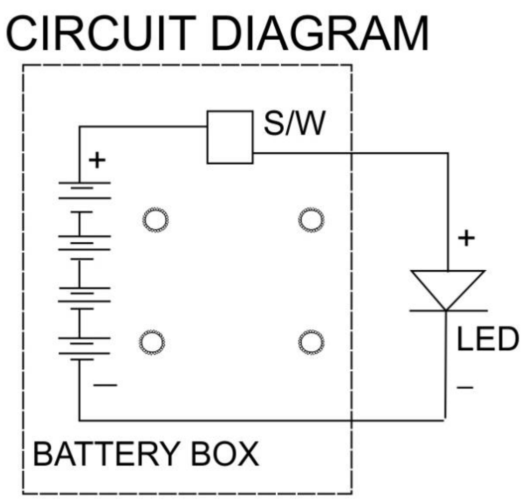
Testing Parameter	Description
Battery Life	Measure the duration the lamp operates on a full charge at various brightness settings. This indicates usability during power outages or extended use.
Charging Time	Assess the time required to fully charge the lamp from a completely depleted state, which helps users plan for usage.
Brightness Levels	Test the lamp's brightness at different settings (e.g., low, medium, high) to determine its versatility for tasks like reading or ambient lighting..
Dimming Capability	Check if the lamp allows for smooth brightness adjustments, enhancing comfort during nighttime use.
Control Method	Evaluate the ease of use of the lamp's controls (touch, remote, or physical switches) to ensure they are intuitive and responsive.
Material Durability	Assess the materials used in the lamp's construction for durability and resistance to wear and tear.
Portability	Test the weight and size of the lamp to determine how easily it can be moved or transported.
Overcharge Protection	Verify that the lamp includes safety features to prevent overcharging, which can damage the battery and pose safety risks.
Heat Generation	Measure the temperature of the lamp during operation to ensure it does not become excessively hot.

Water Resistance	If applicable, test the lamp's water resistance according to its Ingress Protection (IP) rating, especially for outdoor use

These parameters provide a structured approach to evaluating bedside lamps, ensuring they meet user needs and safety standards.

4.4 Working Components and Circuit Diagram;

- Two pin plug
- Plywood
- Screw nail
- Multiple color LED light
- Switch
- Battery
- 1mm cable
- Battery holder
- Soldering Lead



CHAPTER FIVE

DISUSSION, CONLUSION AND RECOMMENDAION

5.1 Discussion

When discussing bedside lamps powered by rechargeable batteries, several key points emerge from user experiences and product features. Here’s a summary of the main considerations:

User Needs and Preferences

Many users express a need for bedside lamps that are not only functional but also aesthetically pleasing. There is a demand for lamps that fit into home decor without looking like children's night lights. Users often seek options that provide adequate lighting for reading or relaxing without the clutter of cords.

Features of Rechargeable Bedside Lamps

Battery Life: A significant factor is how long the lamp can operate on a full charge. Some models can last anywhere from 8 to 48 hours, depending on the brightness settings used. For instance, the O’Bright Portable LED Lamp boasts an impressive battery life of up to 48 hours, making it ideal for extended use.

Brightness Levels: Many lamps offer multiple brightness settings, allowing users to adjust the light intensity according to their needs. This feature is particularly appreciated for creating a cozy atmosphere or for tasks like reading.

Charging Options: Most rechargeable lamps utilize USB charging, which is convenient and compatible with various devices. Some models even include universal charging ports, making them versatile for different charging setups.

Portability: The cordless nature of these lamps allows for easy relocation, which is a significant advantage for users who may want to change their room layout or take the lamp to different areas of the home.

Safety and Durability

Safety features are crucial in rechargeable lamps. Many models include overcharge protection and are designed to minimize heat generation during use. This is particularly important for preventing potential hazards associated with battery-operated devices.

Limitations:

The main limitations of constructing a multiple color LED bedside lamp powered by rechargeable dry cell batteries include:

1. Limited Battery Life and Recharge Cycle: Rechargeable batteries have a finite number charge/discharge cycles before their capacity starts to degrade. This can limit the overall life span of the lamp if the batteries need to be frequently recharged.
2. Lower Brightness Levels: Rechargeable LED lamps may not be as bright as traditional lighting option, which could be drawn back for applications that require high brightness levels.
3. Compatibility Issues: Ensuring the rechargeable LED lamp is compatible with existing features and power source can be consideration.
4. Special Disposal Requirements: The rechargeable batteries in the lamp will need to be properly disposed of a recycles, at they contain materials that should not be thrown in the regular trash.

Conclusion:

Overall, rechargeable multiple color LED bedside lamps offer several advantages, such as energy efficiency, cost savings, and environmental friendliness-however, the limitations around battery life, brightness, compatibility and disposal should be carefully considered when constructing and using such a lamp. Addressing these limitation through careful product construction and user education can help maximize the benefits of a rechargeable multiple color LED bedside lamp.

Recommendation:

Based on the information gathered, here are the key recommendation for constructing a multiple color LED beside lamp powered by rechargeable dry cell batteries.

1. Choose High-Quality Rechargeable Batteries: Select rechargeable batteries with a long life span and high charge capacity to minimize the frequency of recharging and extend the overall usable life of the lamp.
2. Optimize LED Brightness and Efficiency: Utilize the most energy-efficient and bright Led technology available to provide sufficient illumination while minimizing power consumption.
3. Ensure compatibility with Existing Features: Construct the lamp to be compatible with standard bedside lamp features and power source to simplify installation and use.

4. Provide Clear Disposal Instructions: Include detailed information on the proper disposal or recycling of the rechargeable batteries to encourage environmentally responsible end-of-life management.
5. Educate Users on Proper Usage and Maintenance: Provide clear instructions on charging, storage and other best practices to help users maximize the life span and performance of the rechargeable LED bedside lamp.

By addressing these key recommendations, you can construct a multiple color LED bedside lamp that offers the benefits of rechargeable power while minimizing the limitations and providing a user-friendly, sustainable lighting solution.

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A 4 AAAA rechargeable battery holder.
RGB LED light strip or individual RGB LEDs.
Microcontroller (e.g Arduino, Raspberry Pi etc)
Voltage regulator to step down battery voltage to LED Operating voltage Enclosure or housing for the lamp.