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Automatic Switch-Off Battery Charger

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ABSTRACT

This project is titled design and construction of an automatic turn off battery charger. Automatic battery charger presented here is a Ni-Cd battery charger. An Auto turn off battery charger proceeds to charge battery automatically. When the battery is charged it will shut off. Rechargeable batteries store electricity from the grid for later use and can be conveniently recharged when their energy has been drained. The objective of this project is to design and construct an electronic device that will supply electrical energy(charges) to a battery. The designed device consists of a circuit which performs charging and displaying battery charge level by LED during or resting state of charging.

Keywords— Charging, Battery charge, Rechargeable battery.

I. INTRODUCTION

The aim of this project is to introduce technology for reducing the loss of power that is always happening without human intentions. The 'auto' referred here comprises of automatically controlled battery charger. Overcharging of batteries not only reduces their life but also provides a serious threat to humans. The project is mainly based on the automation of charging batteries. All humankind is responsible for preserving energy resources. That is, Electricity is a man-made energy resource. Nowadays, the lack of power is losing by unwanted usage of human society.

Auto turn off charger is an electrical device employed in charging batteries. This charger automatically shuts off the charging process when the battery attains full charge. This prevents the deep charge of the battery. If the battery voltage is below the set value, then the circuit automatically charges the battery. It is observed that irrespective of the level of discharge, most battery service centers often connect the batteries and allow them to charge without a means to automatically disconnect them when they are fully charged in order to prevent over-charge and possible explosion [1]. In some cases, in an effort to deliver quick service and meet customer demand, the charge setting of the battery charger is adjusted to increase the charging current so as to reduce the charging time. Such practices shorten the life time of the battery [2].

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The charger is made up of various electrical and electronic component, which for the purpose of clarity, are group into your basic unit they are:

- The power supply units
- The smoothing circuits
- The regulating unit and
- Regulated D.C charging units

An Auto turn off battery charger is a good option for people who don't like having to mess with the battery charging process too much. Simply hook our battery up to an Auto turn off battery charger and we will find that it proceeds to charge our battery automatically. When the battery is charged it will shut off. A battery will never get overcharged with an Auto turn off battery charger. Many people choose an Auto turn off battery charger over a manual battery charger can fry our batteries by not shutting off when the battery is charger up. This can cause a lot of headaches and prevent us from getting the life expectancy out of the batteries we purchase.

II. SYSTEM OVERVIEW

'Auto turn off battery charger' can automatically control the supply of power to the electronic device during charging. The auto turn-off battery charger for Ni-Cd rechargeable batteries automatically disconnects from the mains to stop charging when the batteries are fully charged. It can be used to charge partially discharged cells as well. The block diagram of this project is given below in fig.1.



Figure 1 Block diagram of charging

III. COMPONENTS REQUIRED

A. PCB

A printed circuit board mechanically supports and electrically connects electrical or electronic components using conductive tracks, pads and other features etched from one or more sheet layers of copper laminated onto and/or between sheet layers of a non-conductive substrate. The holes are connected in rows both horizontally and vertically, as shown below.





B. Jumper wires

These wires are used with breadboard and development boards and are generally 22-28 AWG solid core wire. Jumper wires can have male or female ends, depending on how they need to be used.



Figure 3 Jumper wires

C. Potmeter

A variable resistor is also known as a Potmeter. These components can be found in devices such as a light dimmer or volume control for radio. When you turn the shaft of a potmeter, the resistance changes in the circuit.



Figure 4 Potmeter

D. Multi vibrator

A multi vibrator uses in-depth positive feedback to turn on and off two electronic devices alternately through the resistance-capacitance coupling, thereby self-excites and generates a square wave output. It's often used as a square wave generator.





Figure 5 Multivibrator

E. Resistor

A resistor is a two-terminal passive electronic component used to oppose or limit the current. Resistor works based on the principle of Ohm's law, which states that "voltage applied across the terminals of a resistor is directly proportional to the current flowing through it."



Figure 6 Resistor

F. Capacitor

A capacitor is made from two conductive plates with an insulator between them and stores electrical energy in the form of an electric field. A capacitor blocks the DC signals and allows the AC signals and also used with a resistor in a timing circuit.



G. Transistor

A transistor is a three-terminal semiconductor device. Mostly it is used as a switching device and also as an amplifier. This switching device can be voltage or current controlled. By controlling the voltage applied to the one terminal controls the current flow through the other two terminals. Transistors are of two types: bipolar junction transistor (BJT) and field-effect transistors (FET). And further, these can be PNP and NPN transistors.





Figure 8 Transistor

H. Digital multimeter

A digital multimeter is a device that's used to measure electric current (amps), voltage (volts) and resistance (ohms). It's great for troubleshooting circuits and is capable of measuring both AC and DC voltage.



Figure 9 Digital Multimeter

I. LED

The term LED stands for light-emitting diode. It is a semiconductor device used to emit light whenever a current supply flows through it. In the semiconductor material, the charge carriers like electrons and holes combine then light can be generated. When light generates in the solid semiconductor material, then these LEDs can be known as solid-state devices.



Figure 10 LED



J. Switch

A switch is one kind of electrical component used to connect or disconnect the conducting lane within the circuit so that electric current can be supplied or interrupted from one conductor to another. An electromechanical device is the most common kind of switch that comprises one or more electrical contacts that are movable and connected to other circuits.



Figure 11 A push button switch

K. Battery

The battery is one kind of electrical energy storage device. This device is used to change the energy from chemical to electrical to supply the power to various electronic devices like mobile phones, flashlights, laptops, etc. These consist of one or more cells, and each cell contains an anode, cathode, and electrolyte. Batteries are available in various sizes, which are also divided into primary as well as secondary. Primary types are used until they discharge the power & throw away them afterward, whereas secondary batteries can also be used even after they discharged.



Figure 12 Ni-Cd battery

IV. HARDWARE SYSTEM DESIGN

Presented here is an automatic switch-off battery charger based on a 555 timer IC. This smart charger automatically switches off when your rechargeable batteries reach the full charge. The circuit comprises a bistable multivibrator wired around timer IC 555. The bistable output is fed to an ammeter (via diode D1) and potmeter VR1 before it goes to three Ni-Cd batteries that are to be charged.





Figure 13Circuit diagram of Automatic Switch off battery charger

V. RESULTS

- The green LED (LED1) glows during the charging of the batteries and goes off at the attainment of full charge.
- This automatically disconnects from the mains to stop charging when the batteries are fully charged, i.e.) when the LED goes off.



Fig.15 Output of the circuit

VI. APPLICATIONS

They are used as an alternative source at the time of power failure.

It is suitable for domestic applications.

They are used in remote residential areas.

VII. CONCLUSION AND FUTURE SCOPE

Implementation of Automatic Switch off Battery Charger is a new method to overcome the risk of explosion. It has also nullified the problem of battery corrosion. It is quite efficient and reduced the manpower, maintenance and complexity. There is no need to continuously monitor the batteries and switch off from charging.



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BIOGRAPHY



Ms.G.T.Bharathy was born in India in the year 1979. She completed her B.E degree in ECE in the year 2000 from Madras University, Easwari Engineering College, Chennai, India and M.E degree in the year 2005 Communication Systems in Anna University from Shri Venkateshwara College of Engineering, Chennai, India. She is currently a Research Scholar (part-time Ph.D.) at Department of ECE, Vels Institute of Science, Technology & Advanced Studies (VISTAS), Chennai and also working in Jerusalem College of Engineering, Department of ECE, Chennai as an Associate Professor. She is a member of IEEE and also a life time member in ISTE. She has worked in the Anand Institute of Higher Technology and Prince Shri Venkateshwara Padmavathi College of Engineering, Chennai. She is interested in research areas such as RF and Microwave Circuits, Communication Systems and Wireless Communication & Networks. She has published eight papers in Scopus Indexed Journal, three papers in Springer Scopus Indexed Journal and two papers in IEEE Xplore Digital Library and more than papers in various other reputed National and International Journals.

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