



COIN BASED MOBILE CHARGER USING SOLAR POWER

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ABSTRACT

The coin based mobile battery charger is providing a unique service to the public where grid power is not available for partial or full time. The coin based mobile battery charger can be quickly and easily installed outside any business premises. Many times battery drains out in the middle of conversation particularly at inconvenient times when the access to standard charger is not possible. The coin based mobile charger is designed to solve this problem. The user has to plug in the mobile phone into the adapter and insert a coin; the phone will then be charged. It is, of course, possible to continue charging mobile by inserting more coins. The Arduino microcontroller is programmed for all controlling applications. The source for charging is obtained from solar power. The battery will store the power from panel.

Keywords: Arduino UNO, Color Sensor, IR Sensor, Solar Panel

INTRODUCTION

The growth of mobile phone market is phenomenal in recent years and the need for charging the mobile battery is required anytime and anywhere. In many developing countries the grid power is not available for few hours to several hours on daily basis especially in semi urban and rural areas where the mobile phones are the essential communication device. While the urban population use more sophisticated mobile phones with good power batteries lasting for few days, the rural population buy the pre-owned mobile phones that require charging frequently even two or three times a day[3,4]. In the vent of unpredictable grid power and availability of solar power, a coin based mobile battery charger is designed and developed. This device is like a vending machine for mobile battery charging. The solar power application to the battery charging has been studied in the past. Solar chargers convert light energy into DC current for a range of voltage that can be used for charging the battery. They are generally portable but can be firmly mounted. In this design of coin based mobile charger a fixed solar panel of size 600*385*25,20 WP is used to charge the battery. The main aim of the work is to charge a mobile phone by inserting the coin by using the power obtained from the solar panel. This can be used anywhere as it is portable. It can be mounted on moving public vehicles in order make chargers available for the travelers also[1-2].

PROPOSED WORK

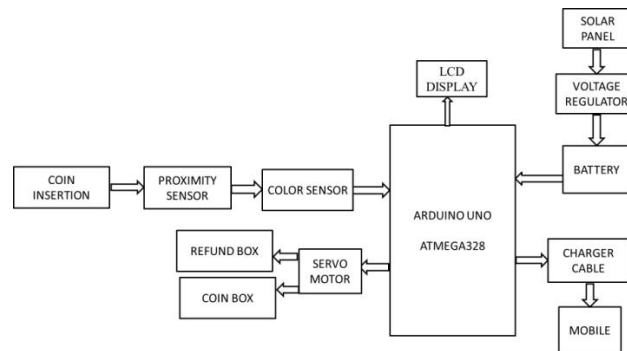


FIG 1: BLOCK DIAGRAM OF THE PROPOSED WORK

The mobile battery charger starts charging a mobile connected to it when a coin is inserted at the coin insertion slot at the input stage. The type of coin and the size will be displayed at the LCD display for the user so as to ensure correct coin insertion. Any other coin, if inserted in the slot will be returned to refund box. A sensor attached to the coin insertion slot accepts the coin into the battery charging unit and start charging the mobile battery for a specific period controlled by the software of the Arduino. The sensor is an IR sensor. The resistance of the sensor decreases when IR light falls on it. A good sensor will have near zero resistance in presence of light and very large resistance in absence of light. When the coin obstruct the IR light falling on the sensor, it sends a pulse to the control unit authorizing the start of charging the mobile battery connected to the device. LCD displays all the information to the customer as and when required. When the mobile battery is connected, it displays “insert coin”. While charging it displays “charging” and at the end of charging cycle it displays “charge completed”. For charging continuously the coin has to be inserted when display shows in fig 1&2.

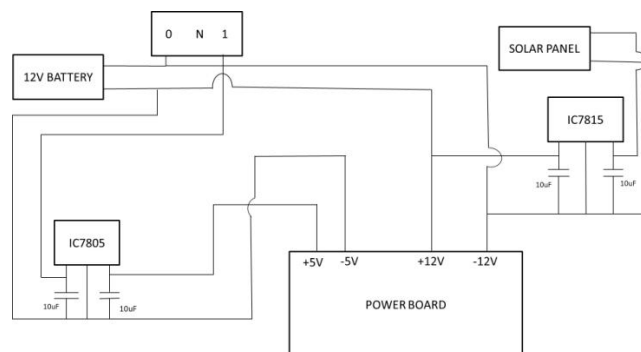


FIG:2 LAYOUT OF POWER BOARD

The solar panel of 21.23 V is used. The voltage regulator is used to convert to 12V and further it is converted to 5V using IC7812 and IC7805 respectively.

MICROCONTROLLER

The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output(I/O) pins that may be interfaced to various extension boards and other circuits. The board features 13 digital pins and 6 analog pins. It is programmable with the Arduino IDE via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltage between 7 and 20 volts shown in fig 3.

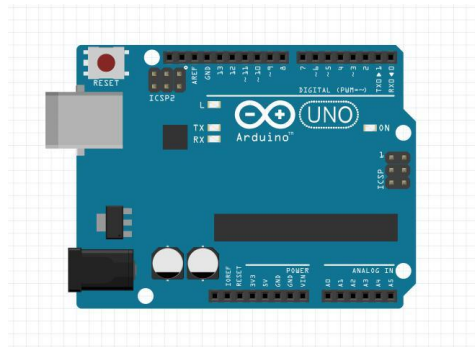


FIG 3. ARDUINO PIN DESCRIPTION

COLOR SENSOR:

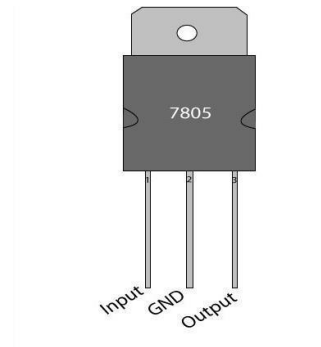
The color sensor is a complete color detector. It consists of a TAOS TCS3200 RGB sensor chip and four white LEDs. It can detect and measure a nearly limitless range of visible colors to a certain degree. The color of an object we can see in fact is chromatic light the object reflex in white light (sun light) after it absorbs the rest once. The white color is a mixture of various visible colors, which means it includes each colored light like red(R), yellow(Y), green(G), blue(B), and purple(P). Based on the theory of three primary colors, and color is made by mixing of the three primary colors (red, green, and blue) in a certain proportion shown in fig 4.



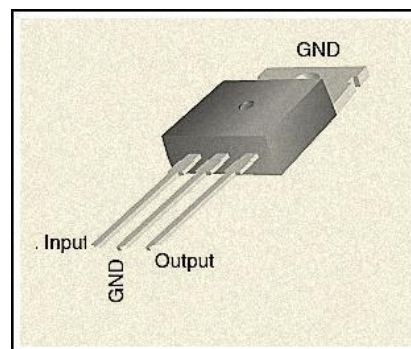
FIG 4. COLOR SENSOR

IC7805:

7805 provides +5v regulated power supply. Capacitors of suitable values can be connected at the input and output pins depending upon the respective voltage levels shown in fig 5.

**FIG 5. IC7805 PIN DIAGRAM****IC7815:**

7815 provides +15 v regulated power supply. Capacitors of suitable value can be connected at the input and output pins depending upon the respective voltage values shown in fig 6.

**FIG 6. IC7815 PIN DIAGRAM****IR SENSOR**

The IR sensor is also known as proximity sensor. A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors shown in fig 7.

**FIG 7.IR MODULE****SOLAR PANEL**

Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity. A photovoltaic module is a packaged connect assembly of typically 6*10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications shown in fig 8.

**FIG 8. SOLAR PANEL****EXPERIMENTAL OUTPUT**

The work mainly focuses on charging the mobile phone battery by using the solar power. The mobile phone will be charged when coin is inserted at the insertion slot and accepted by the Arduino shown in fig 9.

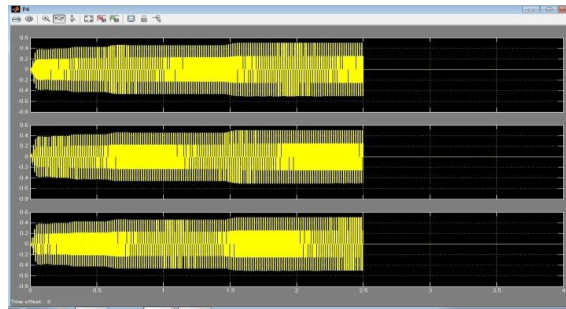


FIG 9. OUTPUT OF THE PROPOSED SYSTEM(V&I RELATIONS)

CONCLUSION

The coin based mobile charger using solar power has been experimentally proven to work satisfactorily by connecting different mobile phones to it and is charged when the coin is inserted at the insertion slot. This system will not use the grid power and is completely based on the solar power. This is more flexible and easy to use and it is portable. Using this system as framework, the system can be expanded to include multiple insertion slots so as to charge multiple mobile phones simultaneously. This system can also be further developed by using the rechargeable cards instead of coins. This avoids the problem of coin rejection.

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