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Coin Based Solar Mobile Charger

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Abstract:-Energy plays a very important role for powering the system to work well either in Humans or in any artificial system. Communication is fundamental need for humans and a mobile system provides the power to communicate with the world so easily. Mobile phone is like a part of our day to day life. Without it, one feels incomplete and unsecure because most of the work is done with the help of it. Smartphone is the most common gadget in cities and also in the small towns now. But a big backlog of this phone is high battery consumption due to several features. Thus, most of the time the smart phones users runs out of battery, suppose on a Railway station a person is waiting for train by enjoying music on phone or surfing internet for any important information and suddenly run out of battery. That time if the charging facility is available somewhere then it is like boon. So, this necessity is being conceptualized in this paper. A Coin Insertion based mobile charger can be useful in today's scenario. It can be used on bus stations, railway compartments, railway stations, etc.

Keywordss: *Arduino, LDR, LCD Display, Relay, Solar panel, Motor Driver, Solar Tracker, Coin Detection Machine, Multi-pin Charger.*

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1. Introduction

In the present era, smart phones are being considered among one of the basic needs of human beings. To fulfill this need in the areas where there is lack of electricity, a system is designed, named as COIN BASED SOLAR MOBILE CHARGER. The idea is taken from the earlier times phone booths. As in PCOs, coin is used to make a call for a particular time limit, this project uses the coin to charge the mobile[1] for a predefined time limit for a particular amount of money.

Keeping in mind the advantages of Green Energy, solar energy is used to run the system. The whole project is divided into two main parts- Solar Energy[4] and Coin Insertion. As the Smartphone provide various features, they come up with a drawback of high battery consumption as a result of which the user suffers 'BATTERY-LOW PROBLEM'. That is why this project is designed so that people can easily charge their phones within an affordable amount of money and even in those areas where there is no proper facility of electricity.

Arduino Uno R3 is used to control LCD DISPLAY UNIT, RELAY AUTOMATION, COIN INSERTION UNIT AND CHARGING UNIT. To make use of maximum amount of solar energy, solar tracking unit is added to the solar panel. Programming of Arduino is done in Arduino IDE which is an open source software.

2. Basic Specifications

The design of coin based solar mobile charger is based on the following specifications:

- A solar panel of 30 watt and 12 volts power supply. For solar tracker[4], stepper motor of 12-24 volts is used.
- A DC battery of 12v, 2.5 Ah is used to store the power from the solar panel.
- A coin insertion machine TW1308 is used to insert the coin for charging the phone. In this design, 1 rupee coin charges the phone.
- A relay is used as a switch which operates at 6 volts DC supply, which is further connected to a multi-pin charger having 5 different pins for different mobiles.
- To display messages, LCD [16x2] is used.
- Arduino UNO R3 controls the whole automation of the system.
- Practically, battery charges in about 2 to 5 hrs while ideal time is 1 hr.
- Battery is consumed within 7 to 8 hrs whereas ideally, it is to be consumed in 11 hrs.

3. System Setup

This system is a solar power based mobile charging system which satisfies the economical parameter as well. In the project, the mobile is charged using solar energy, but another main element of the system is coin insertion. This means that the charging time is based on the coin amount. Firstly the solar panel using solar tracker charges a DC battery. Now, when the coin is inserted in the coin insertion machine, the machine detects the coin and if the coin is detected correctly, it charges the mobile phone and messages are displayed on the LCD display. All the external peripheral devices like LCD, relay, battery, and solar charger are connected to an ARDUINO BOARD, Arduino Uno R3.

Arduino is programmed using Arduino IDE which is an open source software and user friendly.

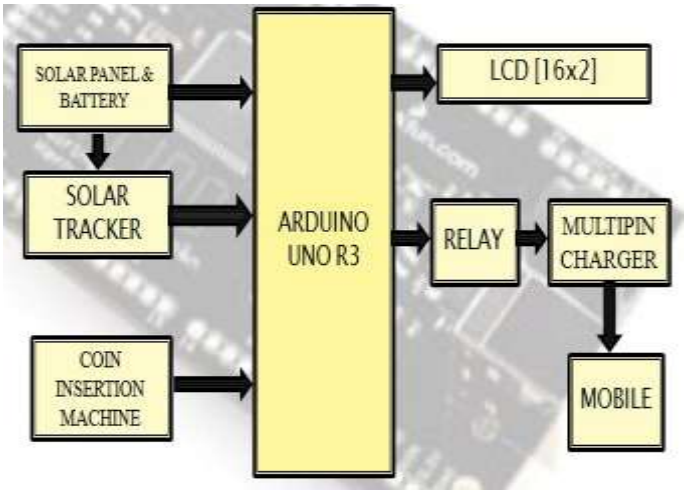

Fig.1: Block diagram of coin based solar mobile charger

3.1. Arduino

Arduino used in the project is Arduino Uno R3 which is interfaced with LCD display, 6 V dc relay and coin insertion machine. Arduino receives signal at receiver pin A0 and relay is connected at pin 2 (transmitter pin). Arduino provides a better platform to the user and uses open source software Arduino IDE.

Fig.2: Arduino UNO R3

3.2. Coin Machine

The idea of using coin machine is taken from the coin telephone booths. The machine used in the setup is TW1308, which is a digital coin machine and has the ability to sense the correct coin similar to the pre decided coin in the coin slot of the machine.

In the project, Coin machine senses the coin size and weight and sends the signal pulse of +5v to arduino.

3.3. Solar Panel/Battery

Solar Photovoltaic panels constitute the solar array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. A single solar module can produce only a limited amount of power; most installations contain multiple modules. Solar panel used in the project is 30 watt/12v and it charges the 12v battery which then charges the mobile phone.

3.4. Solar Tracker

In the Solar tracker system[5], comparator IC1502 is used which compares the results coming from LDR1 and LDR2. As the light falls on LDR1, motor driver IC LM339N drives the motor in clockwise direction and the panel in east direction and when the light falls on LDR2, IC drives the motor in anticlockwise direction and the panel in west direction. When the light falls on both the LDRs, motor stops working. So, basically LDRs sense the light intensity. Where the sunlight intensity is more, LDR intensity is less.

Fig.3: Design of solar tracker

3.5. LCD (Liquid Crystal Display)

To interface with the LCD[3] in 4-bit mode, the Arduino only needs to be connected to pins DB4-DB7, which will connected to digital output pins 5-2 respectively. Pins 15 and 16 on the LCD screen are used to power a backlightl. In order to power the backlight, pin 15 should be connected to ground while pin 16 should be connected to the 5 V output of the Arduino. To power the Arduino a 9 V battery can be connected to the Vin and ground pins on the Arduino. If such power source is available the Arduino can be powered by using its USB connection with a computer.

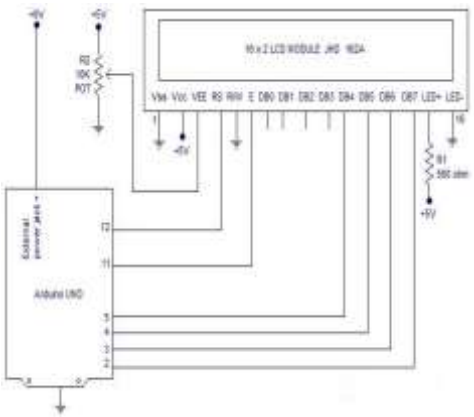

Fig.4: Arduino interfacing with LCD

3.6. Relay

A **relay** is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

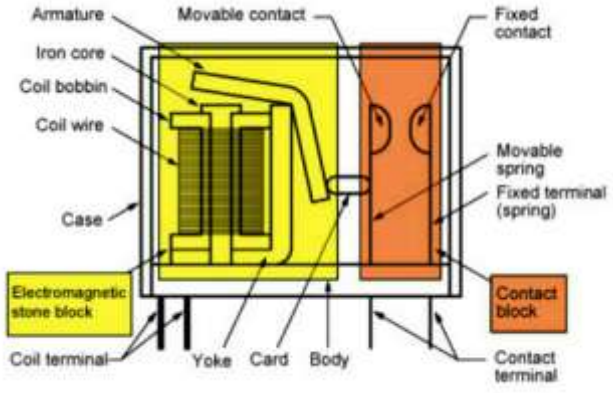

Fig.5:Cross Section Of Relay

3.7. Multi-pin Charger

A multi-pin charger is used to connect different mobile phones to the system so that different phones can be charged through the same setup. This multi-pin charger has 5 different pins for different port using mobiles. The charger connects to the relay which is interfaced by the arduino so that the timing for charging the mobile can be controlled.

4. Simulated Circuit

Simulation is done in Proteus software using arduino library. The simulated circuit setup is shown in fig.5.

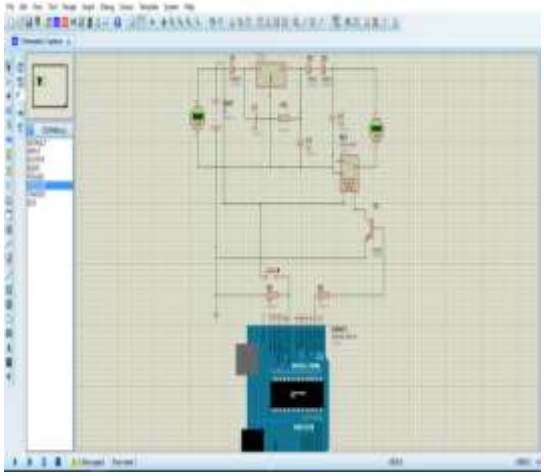

Fig.6:Circuit diagram on proteus software

5. Conclusion

Thus, the proposed project provides the usage of GREEN ENERGY i.e. solar energy in a very effective and economical way. Along with this, it provides a solution to the biggest problem of mobile phones in the present scenario i.e. BATTERY-LOW problem.

However, if built on a large scale with a large panel and heavy motors for tracking, the system can effectively be used commercially in light prone areas.

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