Review Article

SOLAR-BASED RFID VENDING MACHINE

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Abstract: The "Solar-Powered RFID Vending Machine" is a groundbreaking solution aimed at improving the effectiveness, transparency, and accessibility of the Public Distribution System (PDS) in India. The PDS plays a vital role in delivering subsidized food to economically disadvantaged groups, yet it frequently faces issues like inefficiency, corruption, and mismanagement of resources. This system tackles these issues by automating the distribution of essential food items such as wheat and rice, utilizing RFID (Radio Frequency Identification) technology and a solar-powered setup. Each eligible recipient is provided with an RFID card that contains personal information, including ration limits. When the card is scanned, the machine verifies the individual's identity and entitlement, enabling them to choose the required amount of food. The entire dispensing process is automated, guaranteeing precise and efficient ration distribution with minimal human involvement. The RFID system minimizes errors and chances for misuse by tracking and recording each transaction in real time. Along with automation, the machine is powered by solar energy, making it ideal for use in remote regions and areas without reliable electricity access. Using solar power also promotes sustainability by decreasing dependence on traditional energy sources. The machine has sensors that constantly oversee inventory levels, enabling prompt restocking and avoiding shortages.The "Solar-Based RFID Vending Machine" aims to improve food security, ensure fair access to entitlements, and enhance the overall transparency of the PDS. By integrating renewable energy and cutting-edge technology, this project offers a cost-effective and sustainable solution to modernize India's ration distribution system, reducing corruption and enhancing user experience in the process. This innovative approach ensures that vital resources are efficiently and fairly delivered to those who need them the most, improving the effectiveness of the Public Distribution System.

Keywords: RFID, Vending Machine, Solar.

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INTRODUCTION

Vending machines are automated devices that provide products such as coffee, cold beverages, snacks, and tickets. The implementation of these machines in real-time will be beneficial for users. Traditional payment methods for vending machines include cash payments (both bills and coins) and smart card transactions. The use of vending machines has increased significantly in recent years, with more consumers embracing them. While vending machines offer convenience for users, their widespread distribution can lead to challenges in management, control, and maintenance for consumers. This paper introduces a system that does not rely on coins or notes for operation, as the accumulation of coins can pose limitations; when the storage capacity is reached, handling the coins can become problematic. Instead, it utilizes an RFID system. The advent of RFID technology has brought about an innovative cashless payment method, replacing traditional cash-based approaches in vending machines. The incorporation of RFID in vending machines also enhances security and minimizes the need for human labor. This method allows access solely through RFID, preventing potential misuse of the machine. RFID serves as a secure and cost-effective wireless electronic identification technology supported by a capacitive-inductive resonant system. This technology utilizes electromagnetic fields at radio frequencies (RF). The passive RFID package without a battery consists of an RFID card and an RFID reader that operates at a frequency of 13.56 MHz. A small RFID reader is installed on the machine. Each department receives a card equipped with an RFID tag. When a member presents the ID card, they can easily obtain items by showing the ID tag to the reader; this is the sole method for receiving the specified products (such as napkins and medicine), while the master card is responsible for recharging and resetting the quantity.

PROPOSED SYSTEM

The Arduino serves as the primary processing unit. In this vending machine, an Arduino Uno functions as the master controller, complemented by an RFID tag and reader. External components, such as a keypad and display, are typically connected through various pins on

the Arduino Uno. Initially, the RFID card is scanned to read the tag, after which the user can choose the desired merchandise. This process is managed using Arduino software. A motor circuit is situated between the Arduino and the gear motor, as the controller's current is insufficient to power the gear motor, which requires a higher current. The gear motor is linked to a spiral ring, where the products are placed. Ultimately, the user can select the merchandise, prompting the motor to rotate and dispense the item.

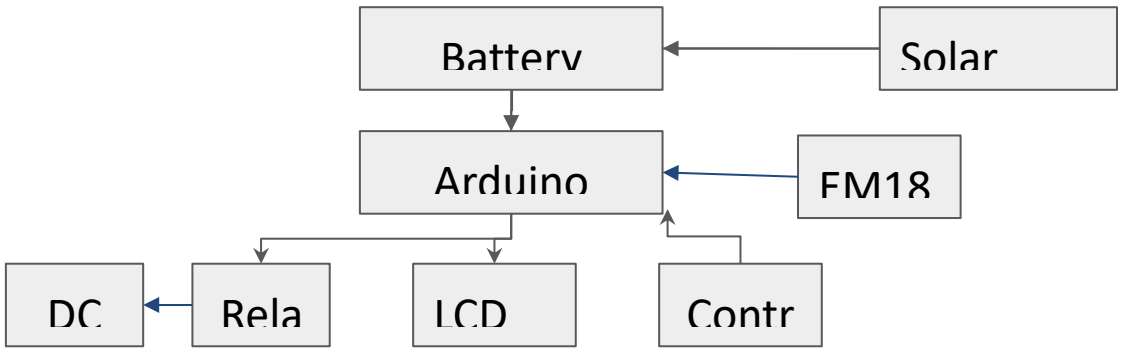

Fig.2.1Block Diagram

EXISTING SYSTEM

In the previous iteration of the medicine vending machine, either a microcontroller or a processor is utilized to manage the entire operation, and the associated coding is notably intricate. This system is also designed to detect the insertion of coins through the currency slot and to determine the precise quantity of product to be dispensed by the electric motor. However, if a counterfeit coin that matches the density and size of a legitimate coin is inserted into the slot, the machine may accept it, resulting in the delivery of products without proper coin validation. This issue represents a significant limitation of the current machine design.

ARDUINO

Arduino Uno is a 8-digit microcontroller board dependent on the ATMega328P. It has 14 computerized input/yield pins (of which 6 can be utilized as PWM yields), 6 simple sources of info, a 16 MHz quartz gem, a USB association, a force jack, an ICSP (In Circuit Serial Programmer) header and a reset button. In this framework, Arduino microcontroller circuit fills in as an information processor that controls the engine associated with twisting spring.

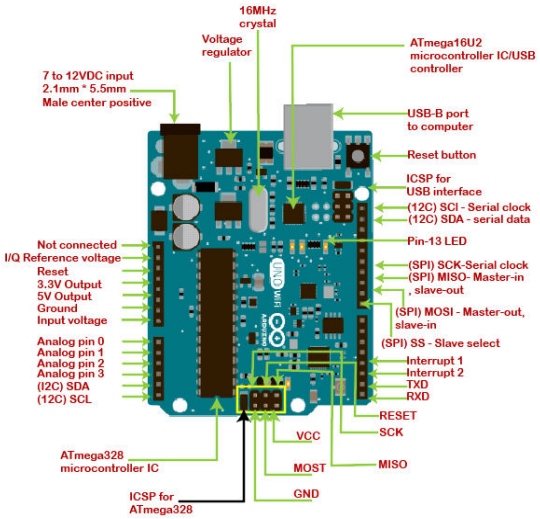

Fig.4.1 ARDUINO

Arduino Uno is a 8-digit microcontroller board dependent on the ATMega328P. It has 14 computerized input/yield pins (of which 6 can be utilized as PWM yields), 6 simple sources of info, a 16 MHz quartz gem, a USB association, a force jack, an ICSP (In Circuit Serial Programmer) header and a reset button. In this framework, Arduino microcontroller circuit fills in as an information processor that controls the engine associated with twisting spring. DSIBINO_V1 is the clone Arduino board. Which means it's all the features of Arduino is included with some special feature like

1. It can be operated from AC or DC 12v power supply.
2. It's come with 2 in-built led for various debugging and testing.
3. Price is lesser because USB programming replaced by FTDI232 PGM facility.

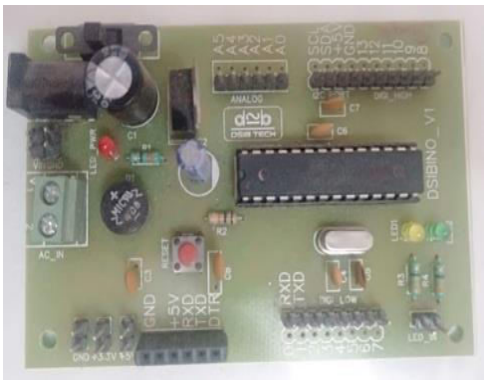

Fig.4.2 Circuit Diagram

RFID READER

A RFID per user is a gadget that is utilized to examine a RFID tag. The per user has a reception apparatus that emanates radio waves; the tag reacts by sending back its information. Various components can influence the distance at which a tag can be perused (the read range). The recurrence utilized for recognizable proof, the reception apparatus acquire, the direction and polarization of the per user receiving wire and the transponder radio wire, just as the arrangement of the tag on the item to be distinguished will all affect the RFID framework's understood reach.

Fig.5.1RFID Reader

FRAMEWORK DESIGN

In this paper, a model of medicine machine that sells two unique sorts of product is planned and built. There was two catches to pick the sort of tidbit. In the wake of picking the necessary bite type, place RFID card to the RFID peruser. At that point the peruser recognizes the card ID and showcases the measure of cash on LCD. Microcontroller drives the engine driver to put out the picked nibble and the leftover equilibrium is shown on LCD. The general circuit outline is appeared in Figure 3.The MDRC522 RFID was picked as the card scanner. This 3.3V board was associated with Arduino in the framework through a level shifter circuit, permitting it to be worked securely by the 5V Arduino. RFID Vcc and ground are associated with Arduino supply and ground pins. MIS0 and MOS1pin are associated with Arduino microcontroller pin 11 and 12. SCK, RST and SDK pins are associated with Arduino microcontroller pin 13, 9 and 10 separately.

CONCLUSION

In this framework, the client need to embed a RFID card and press a catch of client decision and the medicine machine will administer the comparing thing for client. This RFID based Vending Machine is significantly utilizing four durable goods which are: Arduino Uno, two constant pivot DC engines, LCD, RFID card and 12V force supply. Two catches are for choosing the things in the two chambers. LCD shows the messages and guidelines to work the Machine. This framework is versatile, reasonable, burns-through less power and can be made effectively accessible with the goal that the client can utilize this framework at whatever point and whatever.

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