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SMART PORTABLE MEDICINE BOX

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ABSTRACT

As the population ages, the challenges of managing chronic conditions like Alzheimer's disease become more prominent, especially when it comes to keeping up with medication schedules, for elderly individuals, especially those who have memory issues. To aid this problem, we have developed the Smart Portable Medicine Box. The device is specially designed to assist elderly individuals, in managing their medications more effectively. It includes a special cold storage section for insulin, useful to diabetic patients, along with some other features like medication reminders and GSM messaging. Plus, one can customize dosage timing using an RTC module, ensuring that medicines are taken right on schedule. The device aims to lighten the load for patients and caretakers and potentially improve health outcomes. The risk of medication errors could be minimized. Smart Portable Medicine Box has a user-friendly interface making it easy to operate. The device is lightweight, small easy to carry even while traveling, and operates at low power making it more efficient.

I. INTRODUCTION

Elders are essential torchbearers of society. However, as age advances, managing chronic health conditions becomes increasingly challenging. Effective medication management is crucial for keeping elderly individuals healthy and maintaining their quality of life. Among the solutions emerging to address these challenges is the Smart Portable Medicine Box.

The Medicine Box applies strict safety measures to protect healthcare data from unauthorized access and to ensure correct drug dispensing procedures. This enables caretakers to effectively monitor patient health and promptly intervene in case of emergency. The user interface is easy to use, hence it can be used by older people. The medicine dosage is set using the RTC module. When it's time for the medication dose, the buzzer sounds as a reminder. If the dose is not taken or missed, the device sends a message to the designated caregiver.

II. METHODOLOGY

Block Diagram

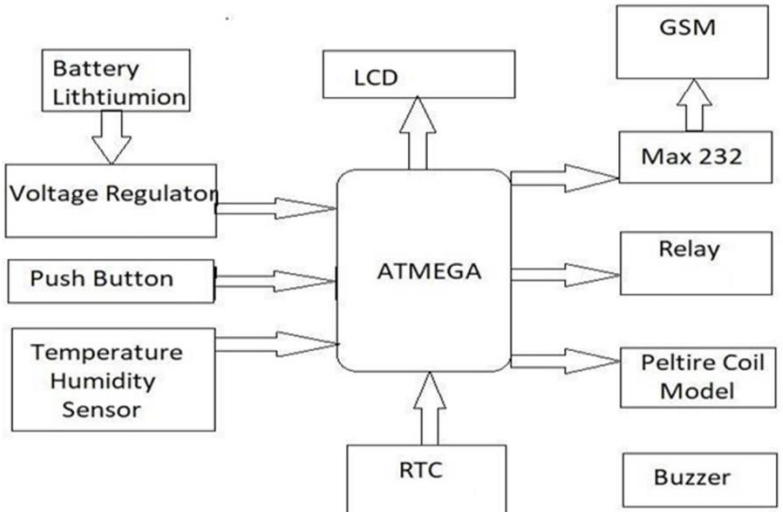

Figure 1: Block Diagram Smart Portable Medicine Box

Various components are used in this Smart Portable Medicine Box that enable effective management of medicines. Its main processing unit is the Atmega328 controller. The box derives power from a battery, thus

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making it portable. The device uses the Peltier coil model to store medicines requiring low temperatures. The GSM module provides messaging services whereas Max 232 supports communication between the PC and microcontroller. This device also has an alert system as well as a display system where a buzzer gives audible alerts while an LCD shows relevant details. RTC module guarantees accurate timekeeping even if the power supply is off.

After starting up, the system is initiated and implemented by the Atmega328 microcontroller. It takes control of monitoring the medicine storage environment. The GSM module gets connected to the caretaker's cell phone and prepares to send notifications if necessary. MAX232 plays an important role in the proper transmission of data between the microcontroller and PC for effective data transfer.

Based on the prescribed dosage timing, the RTC module can send signals that serve as timely reminders, implementing the buzzer and LCD screen to display relevant information.

III. THE HARDWARE

Microcontroller Atmega328

The following is the pin configuration of Atmega 328

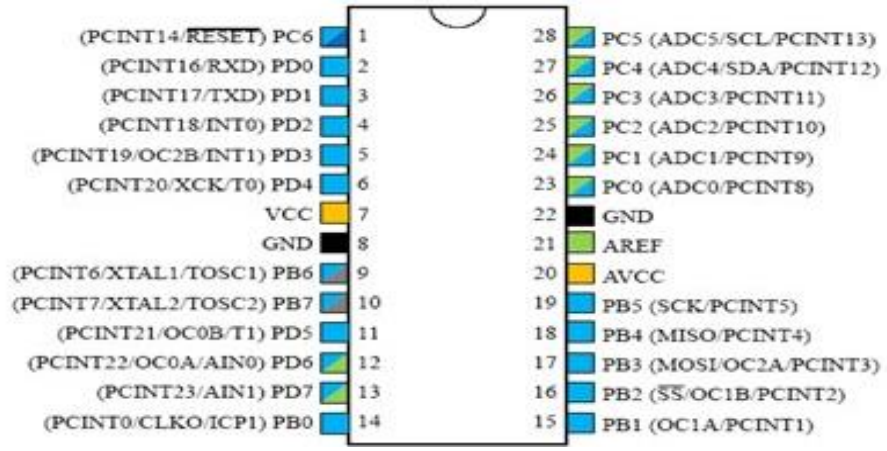

Figure 2: Pin Diagram Atmega328

The Atmega328 is based on the AVR RISC architecture with a clock speed of up to 20 MHz. With 32 KB of flash memory, 2 kB of SRAM, and 1 kB of EEPROM, it stores program code as well as data efficiently. It includes several I/O pins and on-chip peripherals such as timers, UART, SPI, and ADC, which enable smooth interfacing with external devices and sensors. Its low power design and wide voltage range from 1.8v to 5.5v is perfect for battery applications. It provides optimal energy consumption and long battery life.

RTC MODULE

Figure 3: RTC MODULE

RTC, a real-time clock, is an electronic component that tracks the current time. The CPU reads this data via a serial port, usually with software, to perform time-dependent tasks. The RTCs are always working and use low power, they can run while the system is completely off.

Voltage Regulator 7805

For most of the ICs, a 5-volt regulated output is required. There is the possibility of getting unregulated DC voltage, so we used the regulator 7805 solution. The three-terminal positive voltage regulator IC 7805 was specially designed to deliver a 5V-regulated DC output. Its maximum input voltage rating is 35V. It ensures that the power delivered to various components of this system remains stable by using regulator 7805

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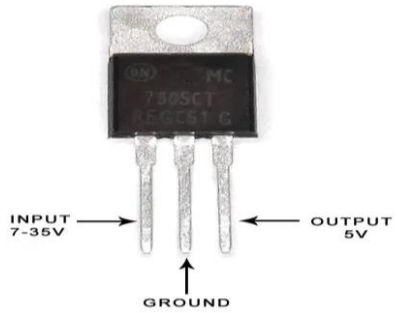

Figure 4: Voltage Regulator 7805

SIM800L GSM

The SIM800L GSM is an important component in the medicine box. It offers various features similar to those of a regular phone, including text messages, and call management. Its compact design and capabilities enhance communication and connectivity within the medicine box. GSM module ensures proper connectivity, allowing remote monitoring and management of medicine box operations efficiently.

Figure 5: SIM800L GSM Module

Max 232

MAX232 is an essential integrated circuit known for its ability to convert signals. It is designed to connect TIA-232 serial port signals with TTL-compatible digital logic circuits, functioning as transmitter/ dual receiver. It is widely used for communication between microcontrollers and PCs.

Figure 6: MAX 232

IV. RESULTS AND DISCUSSION

The pictures below represent the result of the work.

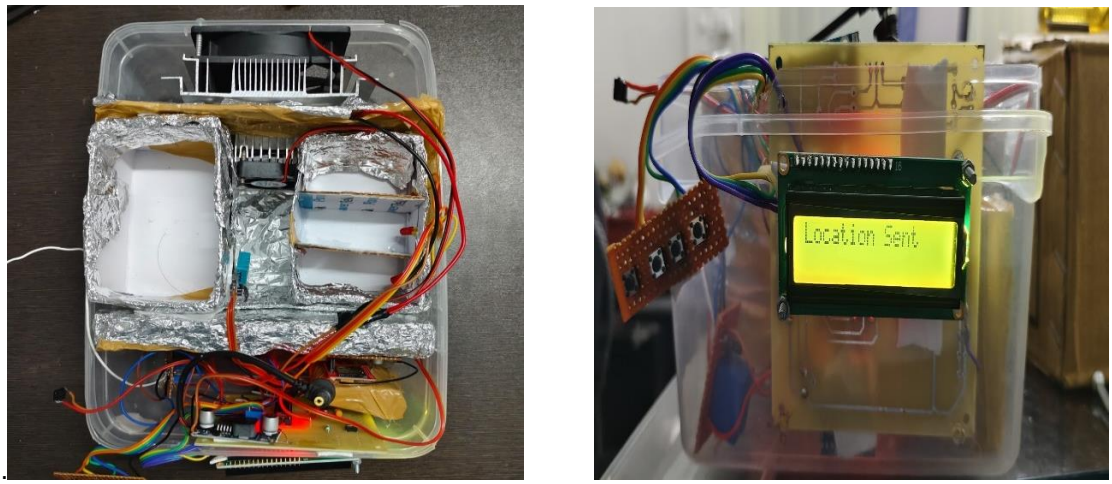

Figure 7: Smart Portable Medicine Box

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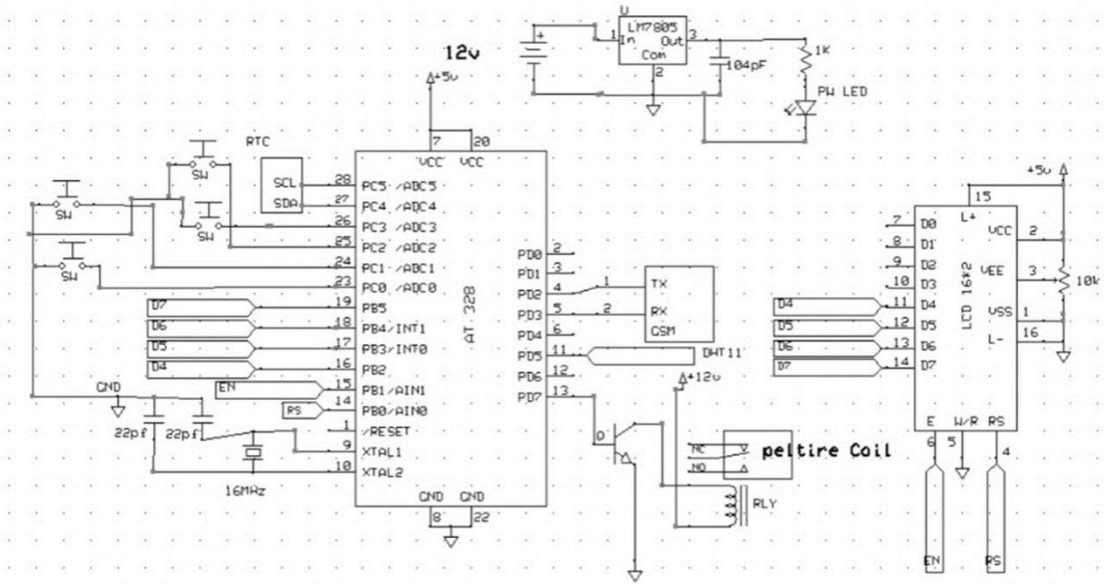

Figure 8: Smart Portable Medicine Box Circuit Diagram

Two compartments have been created for storage purposes- one for insulin and the other the medicines. The insulin section is appropriately insulated to maintain the required temperature and ensure it stays cold. The device is designed with a switch to initiate the device. Overall circuit operation was in excellent condition and performed as expected. Connections are established based on the circuit diagram. As this is the initial prototype, "There is a scope for improvement to make it better."

V. CONCLUSION

The Smart Portable Medicine Box project started with selecting an idea to address challenges faced by elders in managing their medication. After proper planning and consultation with experts, a prototype module for the medicine box was created successfully. Testing and evaluation of the prototype gave positive results. The Successful development of the prototype confirmed the project's main goal was achieved successfully. The device also has great potential for future development. Upgrades like adding sensor-based medication tracking, remote monitoring abilities, and compatibility with wearable devices can be done in the future. The device can also be integrated with health apps to monitor data.

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