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MICRO CONTROLLER-BASED SANITARY NAPKIN DISPOSAL & VENDING MACHINE

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ABSTRACT

Sanitary napkin disposal presents a important environmental and health challenge due to inadequate disposal methods, which can lead to issues such as odour, contamination, and spread of disease. This project introduces an automated, microcontroller-based sanitary napkin disposal & Vending machine that addresses these issues by providing a safe and convenient method for disposal. Using sensors, motors, and a heating element (for incineration if applicable), the machine efficiently disposes of napkins. The microcontroller controls the systems, ensuring hygiene and reducing environmental impact.

This project demonstrates the effective use of embedded systems in solving real-life problems, promoting menstrual hygiene, privacy, and environmental responsibility. Its application can be extended to schools, colleges, railway stations, public restrooms, and workplaces. Additionally, the modular and low-cost design ensures scalability and adaptability for rural and urban implementation.

Keywords: - Microcontroller, Automation, Real time control

1. INTRODUCTION

Sanitary waste management has become a important public health and environmental challenge. Unsuitable disposal of sanitary napkins can lead to health risk, contamination of the environment, and difficulties in waste segregation. The growing awareness about sustainable practices and hygiene emphasizes the need for effective disposal solutions.

This project aims to design and develop a microcontroller-based sanitary napkin disposal machine, which provides a safe, efficient, and eco-friendly method to address this issue. The planned system uses a microcontroller to automate the disposal process, controlling features such as sensor-based napkin detection, controlled incineration, and emission control mechanisms.

The machine is designed to confirm minimal human intervention, promoting convenience and hygiene. It is suitable for deployment in diverse locations, including schools, offices, public restrooms, and healthcare facilities. By offering a compact and cost-effective solution, this project contributes to improving community hygiene and reducing the environmental footprint of sanitary waste.

The following portions of this report detail the design, implementation, and testing of the disposal machine. It highlights the materials used, the working mechanism, and the results obtained during the development process. This project not only addresses a pressing societal need but also serves as a step toward achieving sustainable waste management solutions.

2. LITERATURE SURVEY

2.1 Literature review

A study by Dr. R. Shalini et al. (2017) designed a coin-operated sanitary napkin vending machine with basic dispensing functionality. However, it lacked a smart control unit and feedback mechanisms.

S. Dhanalakshmi et al. (2020) developed a microcontroller-based smart dustbin that used IR sensors to detect waste and automatically open the lid. This demonstrated the feasibility of using embedded systems for hygiene-focused automation.

Sharma et al. (2021) proposed a fire and gas leak detection system using Arduino and flame sensors, which can be adapted for use in controlled incineration of sanitary waste.

Studies from IEEE conferences have proposed IoT-based vending systems for medicines and smart dustbins with fill alerts, indicating the potential for similar integration in sanitary napkin management systems.

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3. PROTECTION AND CONTROL MECHANISM

Microcontroller Unit (MCU)

The heart of the machine is a microcontroller such as Arduino UNO. It controls the operation of:

Coin/QR reader

Napkin dispensing motor

Temperature regulation system for the incinerator

Sensors for safety and monitoring

Input Interfaces

Coin acceptor module / RFID reader / QR scanner: Accepts input for vending activation.

Push Button: Activates incineration or initiates vending manually.

LCD/LED Display: Displays instructions, error messages, and system status.

Motor Control Circuit

Controls the DC motor/servo motor used to dispense sanitary pads.

Motor is activated for a fixed time duration after valid input.

Timer/Relay Module

Used in the incinerator section to: Limit the burn time to avoid overheating. And Power on/off the heating coil based on duration and temperature.

Overheat Protection (Thermal Monitoring)

Temperature Sensor is used to monitor the internal temperature of the incinerator.

If temperature exceeds a predefined threshold (e.g., 250°C), the microcontroller cuts off the heating element via a **relay**.

Prevents fire hazards or damage to internal components.

Overcurrent Protection

Fuses are placed on power lines to protect motors, heater coils, and microcontroller circuits from overcurrent damage.

4. COMPONENTS (TOOLS)

Arduino uno (Microcontroller):

Operating based on temperature, speed, and current inputs to monitor the operation of motor and control it.

Fig.1. Micro Controller

MCB:

A Miniature Circuit Breaker (MCB) is an electromechanical device designed to protect an electrical circuit from damage caused by overcurrent or short circuits. It automatically switches off the electrical circuit during abnormal conditions such as overloads or faults.

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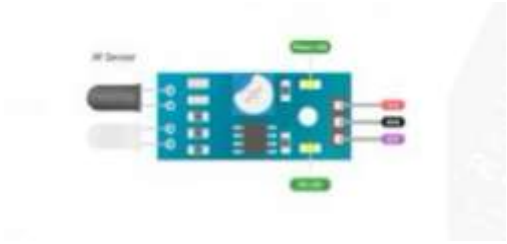
Coin Acceptor /IR Sensor Module with Preset:



An IR (Infrared) Sensor Module with Preset is an electronic device used to detect the presence of an object or obstacle using infrared light. It typically consists of an IR LED (transmitter), a photodiode (receiver), and a preset potentiometer to adjust the sensitivity or range.

12 V DC motor (For Vending)

A 12V DC motor is a type of direct current motor that operates on a 12-volt power supply. It converts electrical energy into mechanical motion using the interaction between magnetic fields and current-carrying conductors.

DC Power Supply

A DC (Direct Current) power supply is an electronic device that provides a constant direct voltage to power electronic circuits, devices, or systems. It converts AC (alternating current) from the mains into a stable DC output.

Heating element (For Disposal)

A heating element is a device that converts electrical energy into heat through the process of Joule heating. When electric current passes through the element, the resistance causes the electrical energy to be transformed into thermal energy, which is then used for heating.

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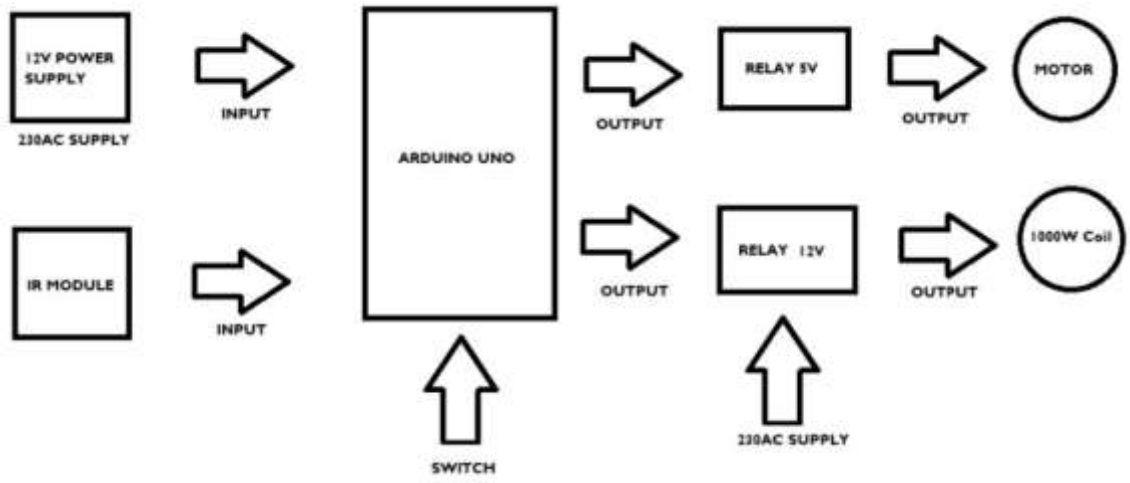
Relay module

A Relay Module is an electronic device that allows low-power microcontrollers (like Arduino, Raspberry Pi) to control high-voltage or high-current loads (like AC lights, fans, or motors) using an electromechanical switch called a relay.

5. BLOCK DIAGRAM



6. RESULT

7. CONCLUSION

The Microcontroller-Based Sanitary Napkin Disposal Machine offers an efficient, hygienic, and eco-friendly solution for disposing of menstrual waste. By automating the process using sensors, heating elements, and a microcontroller, the machine ensures safe incineration of napkins with minimal environmental impact. Its compact design, user-friendly interface, and built-in safety features make it a practical choice for deployment in public restrooms, schools, and workplaces.

8. FUTURE SCOPE

 Integration of IoT: Incorporate IoT features for remote monitoring and maintenance alerts.

 Energy Optimization: Use renewable energy sources like solar panels for powering the system.

 Emission Control: Add advanced filters or scrubbers to minimize smoke emissions further.

 Scalability: Design larger machines for industrial use or smaller ones for personal/home use.

 Awareness Campaigns: Deploy machines alongside educational programs to promote proper menstrual waste management.

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