BEDSPACE DORMITORY SMART BED

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ABSTRACT

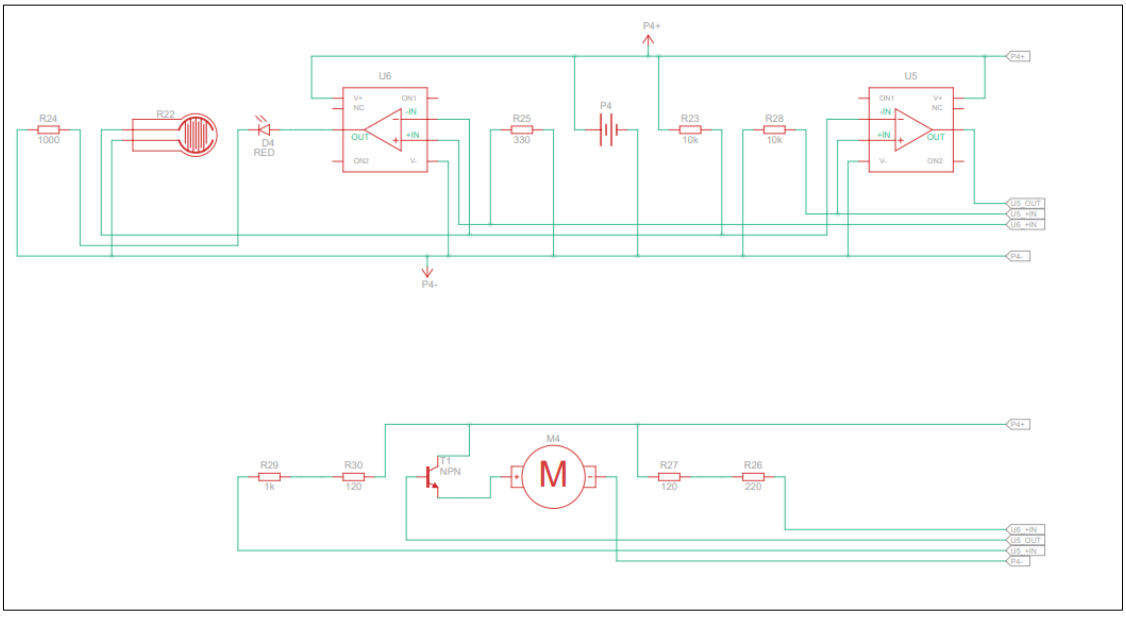
In the modern dormitory setting, occupants often grapple with the challenge of creating a comfortable and productive living space. To address this issue, the "Bedspace Dormitory Smart Bed" project integrates Pressure-Sensitive Resistors used as sensors and operational amplifiers (op-amp). This system addresses the issue by detecting changes in bed occupancy and responding accordingly.

The primary feature of this smart bed is its ability to turn on a small electric fan (represented by a miniature dynamo-powered electric fan) when it detects an increase in pressure, indicating that a user is present on the bed. As more objects are added to the bed, signaling that the user may be engaged in activities such as schoolwork, the system further responds by activating a light source (in this case - an LED), providing adequate lighting to support these tasks.

By introducing this responsive technology, the Bedspace Dormitory Smart Bed not only mitigates the discomfort of dormitory living but also offers a practical solution to enhance user comfort and convenience. Additionally, it provides an energy-efficient solution as it automates the activation of the fan and LED only when necessary, reducing unnecessary power consumption.

DESIGN IDEA

The schematic below illustrates the circuit design that underpins the functionality of the "BedSpace Dormitory Smart Bed" system made using TinkerCAD:



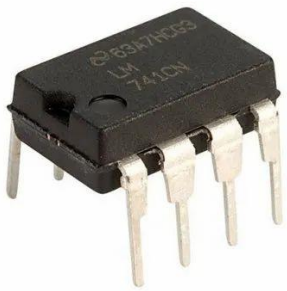
SELECTION OF COMPONENTS

Listed are the components to be used for this project:

1. *Cannon AM-838S Multiple AC-DC Adaptor - Power Supply*

2. *ZD10-100 0-500g Pressure Sensor*

3. *LM741CN opAmp*

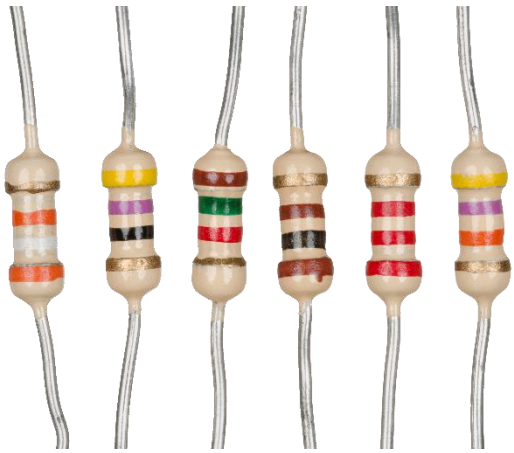


4. *3V DC Motor*

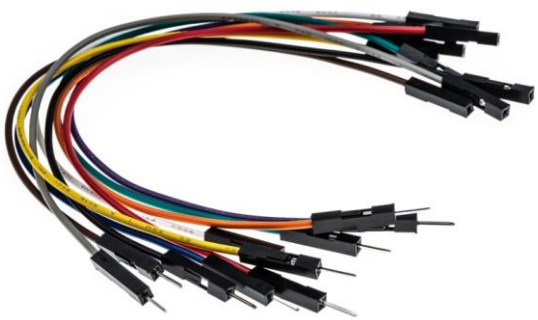
5. *KN2222A NPN Transistor*

6. *Red LED*

7. *Resistors*



8. *Jumper Wires*



CONTROL CIRCUIT/SYSTEMS

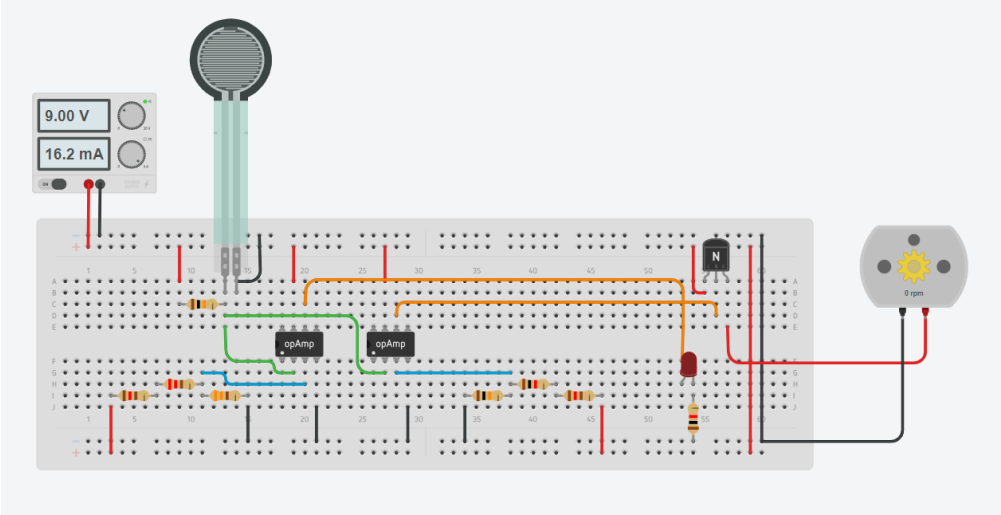


Figure 1: idle/initial state

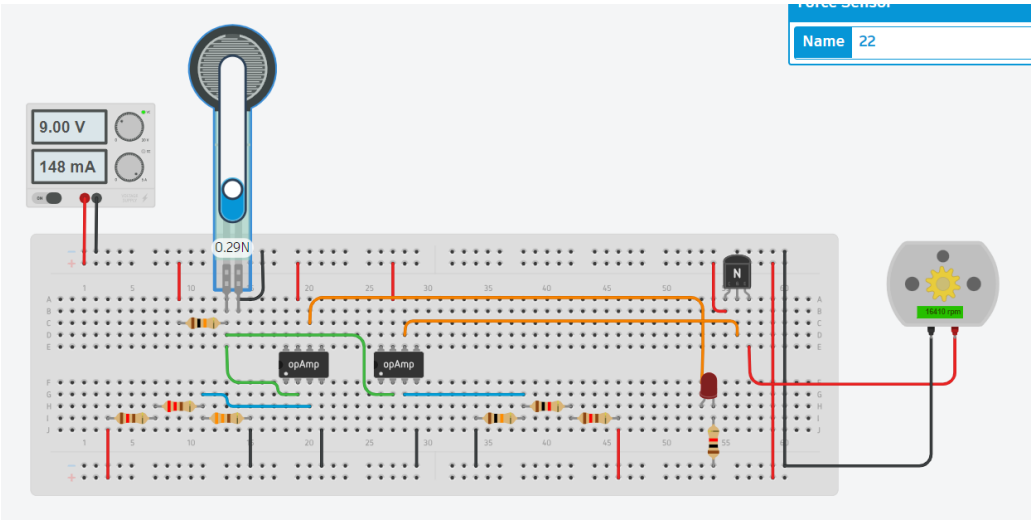


Figure 2: dynamo activation upon pressure detection

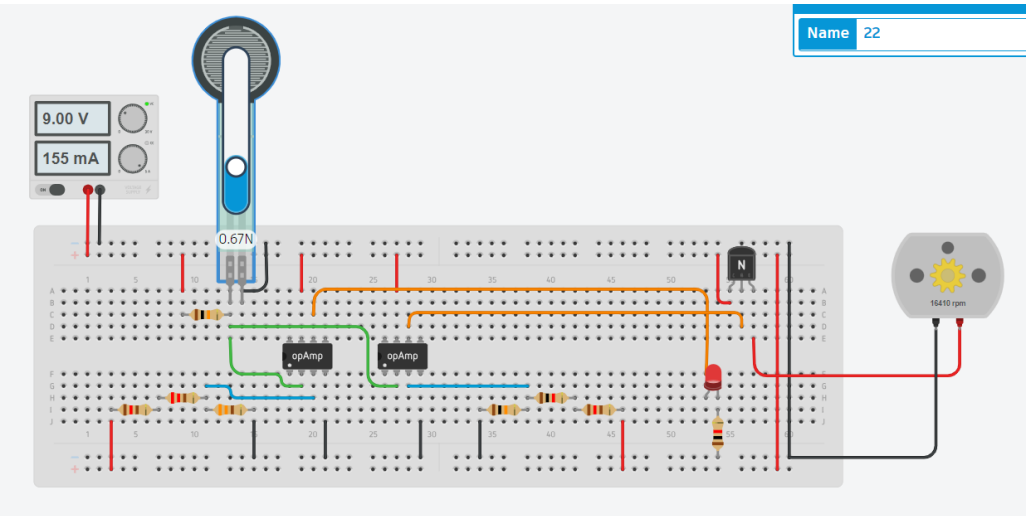
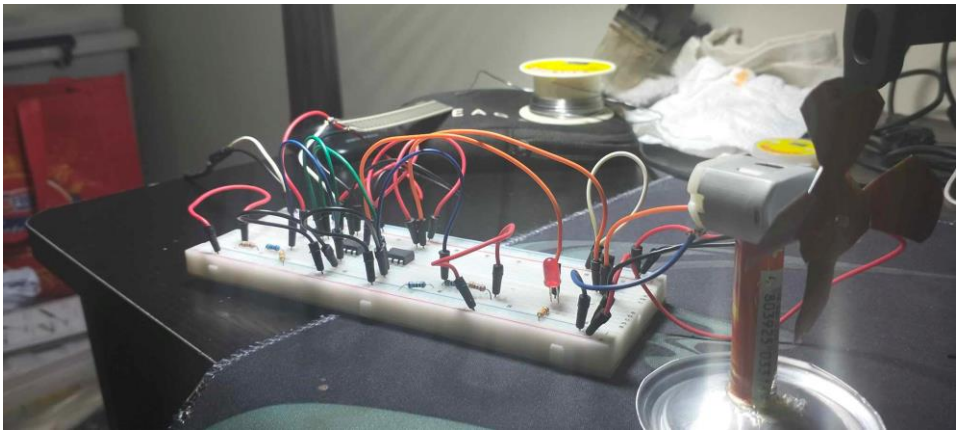
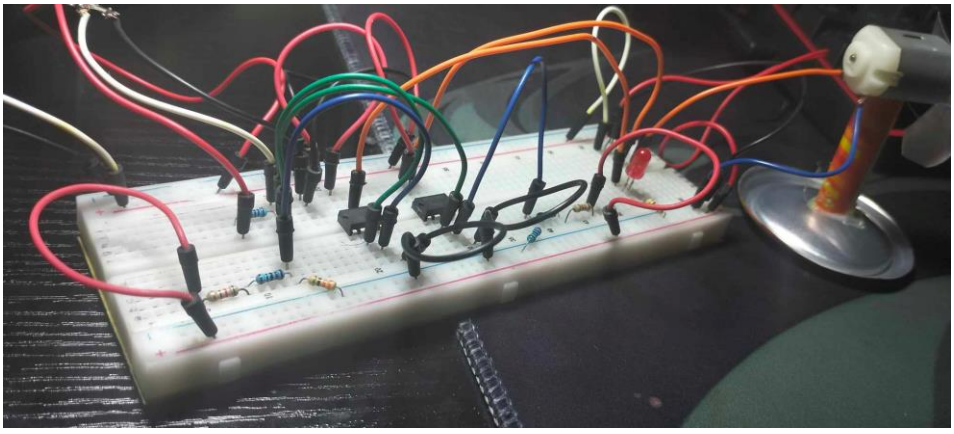


Figure 3: LED activation with increased pressure

At the core of this circuit is the Pressure-Sensitive Resistor (PSR), which acts as the crucial sensing component. When a user is on the bed, the PSR detects pressure changes and sends an analog signal to the operational amplifier (op-amp). The op-amp amplifies this signal, enabling precise detection of user presence. This amplified signal is then sent to the LED and transistor, which then controls the 3V DC Motor. The signal amplified by the operational amplifier (op-amp) possesses insufficient power to drive the dynamo directly due to the high voltage drop required for dynamo activation. In essence, the op-amp lacks the capability to provide the necessary voltage to power the dynamo independently. To address this limitation, we incorporated an NPN transistor into the circuit design, positioned to bridge this gap and facilitate the interaction between the op-amp and the dynamo.





Photos of implemented circuit design