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Sensor aided pressure cooker whistle counter

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ABSTRACT

Sensor aided pressure cooker whistle counter is a type of equipment wherein any user would be able to count the number of whistles coming out from a pressure cooker as a result of the releasing of pressure. It tracks the movement (lift to be specific) of the weight in the upward direction using a proximity sensor mounted close to the weight. The Arduino Uno is programmed in such a manner that for a lift of the weight, the counter increases its value by one. It is also programmed in a fashion that a buzzer alerts the user once the number of whistles exceeds the desired number set at the initial stage. The counter displays the required number of whistles and the present number which has gone by. The sensor probe is mounted atop the cooker lid using a thermocol base for the prototype version. In actual practice, any material which could withstand high temperatures could be used. The circuit connections and other electronics are bolted to a common plywood base in order to avoid clumsiness. The main purpose of developing such a device is not to lose the tradition of cooking in a pressure cooker and rather causing ailments to human health by employing an electric rice cooker.

Keywords— *Infrared, Arduino, Counter*

1. INTRODUCTION

Multitasking has become the key for success of any individual in this modern era. Hence it is indispensable for someone who wants to be jubilant. This could be done in a wide array of ways. In our project, any task along with the counting of whistles blown by the pressure cooker could be counted and made with an indication to the operator. By installing this product on any standard cooker, the user would not have a restlessness regarding the percentage of cooking of the food with respect to time. The setup is very simple (i.e.) mounting atop the cooker lid and therefore it could be a handy equipment for bachelors who are basically amateurs in cooking. The most prominent element of this setup is an infrared sensor which emits infrared radiations, get reflected by the weight of the cooker and received by the receiver. This signal is taken to the counter to add on and display an incremented value.

2. IR TRANSMITTER AND RECEIVER

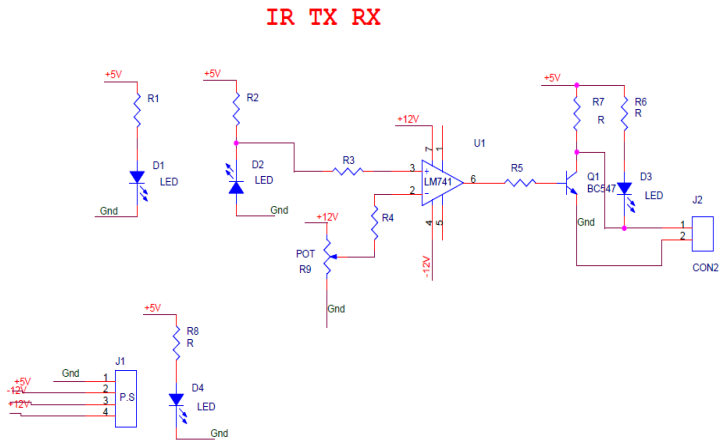

Fig. 1: Infrared transmitter

R1=470ohm; R2=100k, R3=10k, R4=10k, R5=10k, R6=470ohm, R7=10k, trimpot=10k; NPN=BC547

Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other. The transmitted signal is given to IR transmitter whenever the signal is high, the IR transmitter LED is conducting it passes the IR rays to the receiver. The IR receiver is connected with comparator. Now the comparator output is in the range of +12V. Here the transistor acts as a switch and hence the collector and emitter will be closed. The output is taken from collector terminal. Now the output will be zero.

3. ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

3.1 Technical Specifications

- Microcontroller: ATmega328
- Operating Voltage: 5V Input Voltage (recommended) 7-12V Input Voltage (limits) 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA DC Current
- Flash Memory: 32KB
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock size: 16MHz

3.2 Programming

The Arduino Uno can be programmed with the Arduino software. Select "Arduino Uno w/ ATmega328" from the Tools > Board menu. The ATmega328 on the Arduino Uno comes burned with a bootloader that allows one to upload new code to it without the use of an external hardware programmer. It communicates using the authentic STK500 protocol (reference, C header files).

3.3 Usage of Arduino Uno

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Arduino programming language.

4. RELAY MODULE

A Relay is an electromechanical device which uses an electromagnet to operate a pair of movable contacts from an open position to a relatively closed position. The advantage of relays is that it takes a marginally a small amount of power to operate the relay coil, but the relay itself can be used to control motors, heaters, lamps or AC circuits which draws a lot more electrical power.

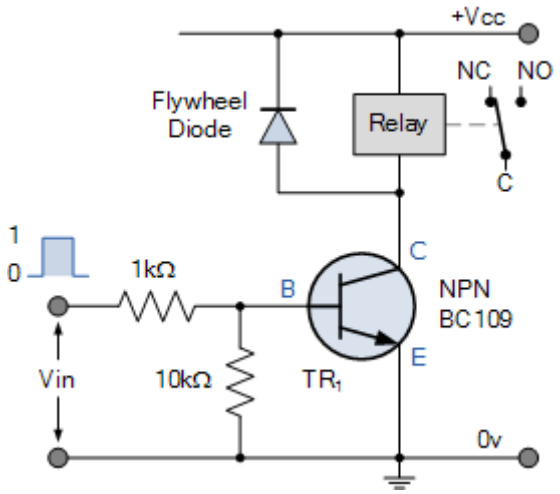

Fig. 2: Relay Module

5. SWITCHES

When the digital input is high the transistor will be turned on which results in a direct path from the port pin to ground and therefore the pin is logic 0. When the digital input is low, the transistor is off which means there is no path for the current from the collector to the emitter. Therefore, the port pin will read 5V. This circuit results in logic inversion, but this should not be a problem as inverting the port pin. When the transistor is on the port pin is connected directly to ground. Therefore there is a path for the 1.6 mA from the port pin (TTL current when input is LOW). The 10 K emitter resistor ensures the current from the supply is kept low, an important consideration in battery powered devices. When the transistor is off the port pin is at 5 V but in reality it will not be exactly 5V because a transistor is never fully off and a small current will flow through the emitter resistor, resulting in a small voltage drop across the resistor - but the voltage level on the resistor will still be close to 5 V. Since there is very little current flowing, power consumption is kept low.

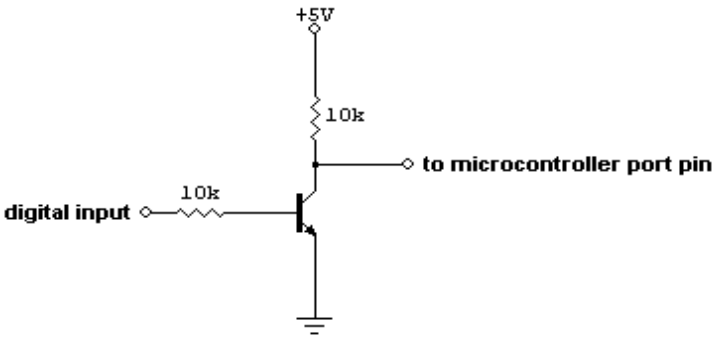

Fig. 3: Switch Circuit

6. COUNTER DISPLAY

The 87/256 event counter displays the number of inputs received on a 2 to 8-digit display field. The count value is stored in an EEPROM which makes it possible for the unit to retain the last count in the event of power loss, without battery back-up. The scale factor for each input is set to 1. The scale factor can be modified in the field by using 87 Express, a Windows based Setup Utility, or via Mini-T a handheld terminal available from Vorne. The display value is the product of the scale factor and the actual counts received since the last reset. An RS232 serial port is provided standard with each counter for connection with any other electronic devices for user friendliness.

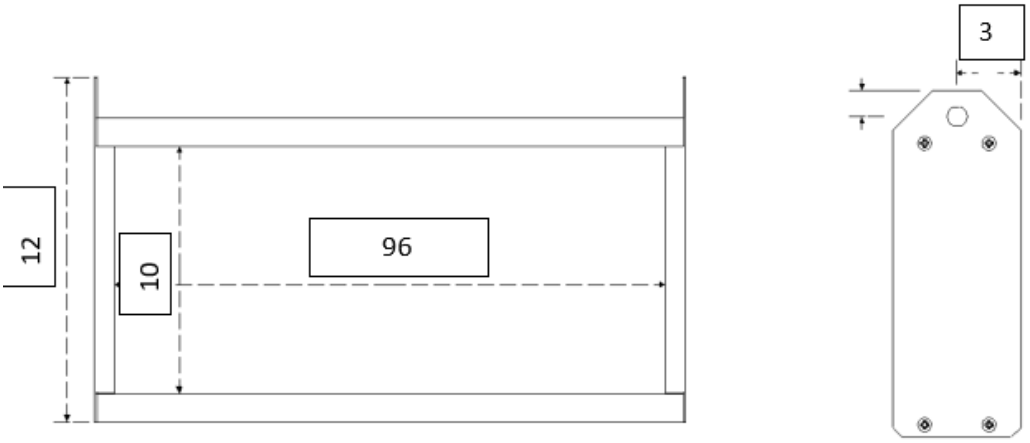

Fig. 4: Display unit dimensions in first angle projection

All dimensions are in mm

7. MOUNTING

The electronic components are all mounted on a plywood board of 30cm*30cm to accommodate them in a convenient manner. To ensure stability of those components, they are screwed to the plywood board with a definite spacing for wiring. On the other hand, the infrared sensor also has to be mounted atop the cooker lid. This is to be made of accurate dimensions as a small change would affect in counting of whistles. The elevation of the cooker weight from the top of the lid at rest is 41 mm. Whenever a whistle is blown out, the weight moves up by 3 mm and hence the net height would be 44mm. Its adequate to design the mounting with a high dimensional accuracy. Therefore, a thermocol piece is cut out with a height of 41 mm and sealed with insulation in order to avoid heat transfer to the sensor. The sensor is the placed atop the thermocol mounting. When a whistle blows, the weight lifts by 3 mm and as a result the count increases by one due to the proximal contact between the sensor and the weight in the air.

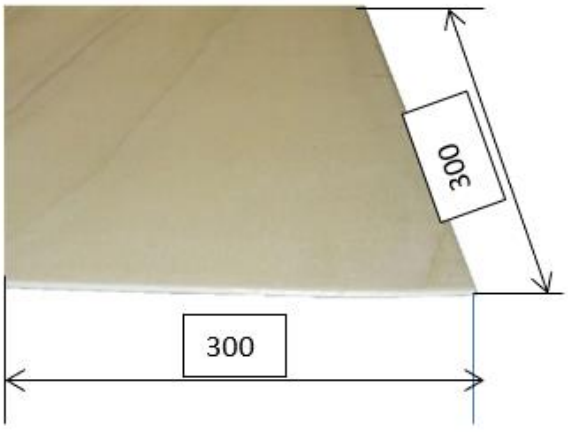

Fig. 5: Plywood piece

All dimensions are in mm

8. FINAL PROTOTYPE

Fig. 6: Working apparatus

9. CONCLUSION

The pressure cooker whistle counter is a completely new product and it could be marketed easily thanks to the value it possesses. The pricing of the product could be made appropriately. The developed product would certainly aid users to count whistles automatically rather than waiting near the stove. This product is also suitable for any generation user in the market because food preparation is common in all era. This product is a boon to those who prefer traditional methods of cooking and are conscious about their physical health and want to be off infirmities.

10. FURTHER RESEARCH AVENUES

- Size of the product could be made more compact
- Better insulation for the sensor as environmental heat may affect it
- Built in versions of the counter could be introduced alongside the induction stove.

11. REFERENCES

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