

KEY CONTROLLED DOOR AND WINDOW CLOSING SYSTEM

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ABSTRACT

This project presents a novel approach towards home automation through a prototype design of a key controlled door and window closing system. This system is designed not only to provide security to homes but also to assist and provide support to elderly and the differently abled individuals. And as all automation systems, this system is also used to reduce the human efforts and make life more comfortable and easy. This system can be implemented without much changes in the house. A simple door key is used to control the circuit and as the main door key is locked the circuit gets activated and all the windows and doors within the home will get closed. With the help of a limit switch the circuit is opened thereby reducing operational power consumption of the system. The system thus leads to a user friendly design with minimum cost.

Keywords: Automation, cost effective, door, key, window

1.INTRODUCTION

With the advancement of technology, automation has become an integral part of today's cutting edge research. It is widely used as it reduces human efforts and errors and increases security. Now a days, an extensive research is being carried out in this domain by using different technologies like GSM modem along with Microcontroller [1], Bluetooth[2] etc. However, in order to control the automation system using these technologies requires special softwares along with the skills and knowledge to use them. Hence, it cannot be operated by everyone and is not user friendly.

Also, many a times due to busy schedule many people forget to close the windows and or doors of rooms, balcony and terrace which not only increases the security threats and subsequent adverse consequences.

Hence, in order to avoid such critical situations and to minimize efforts, we proposed to create an automatic system of closing the sliding windows and the doors of home with a single key.

The system as designed is simple, economical and user friendly. In the designed system, after closing the key, the main circuit receives a signal which supplies current to window motor thereby closing the window. Once the window is fully closed the motor stops running causing the window to stop moving further. And in similar fashion the door also gets closed.

2. FLOWCHART

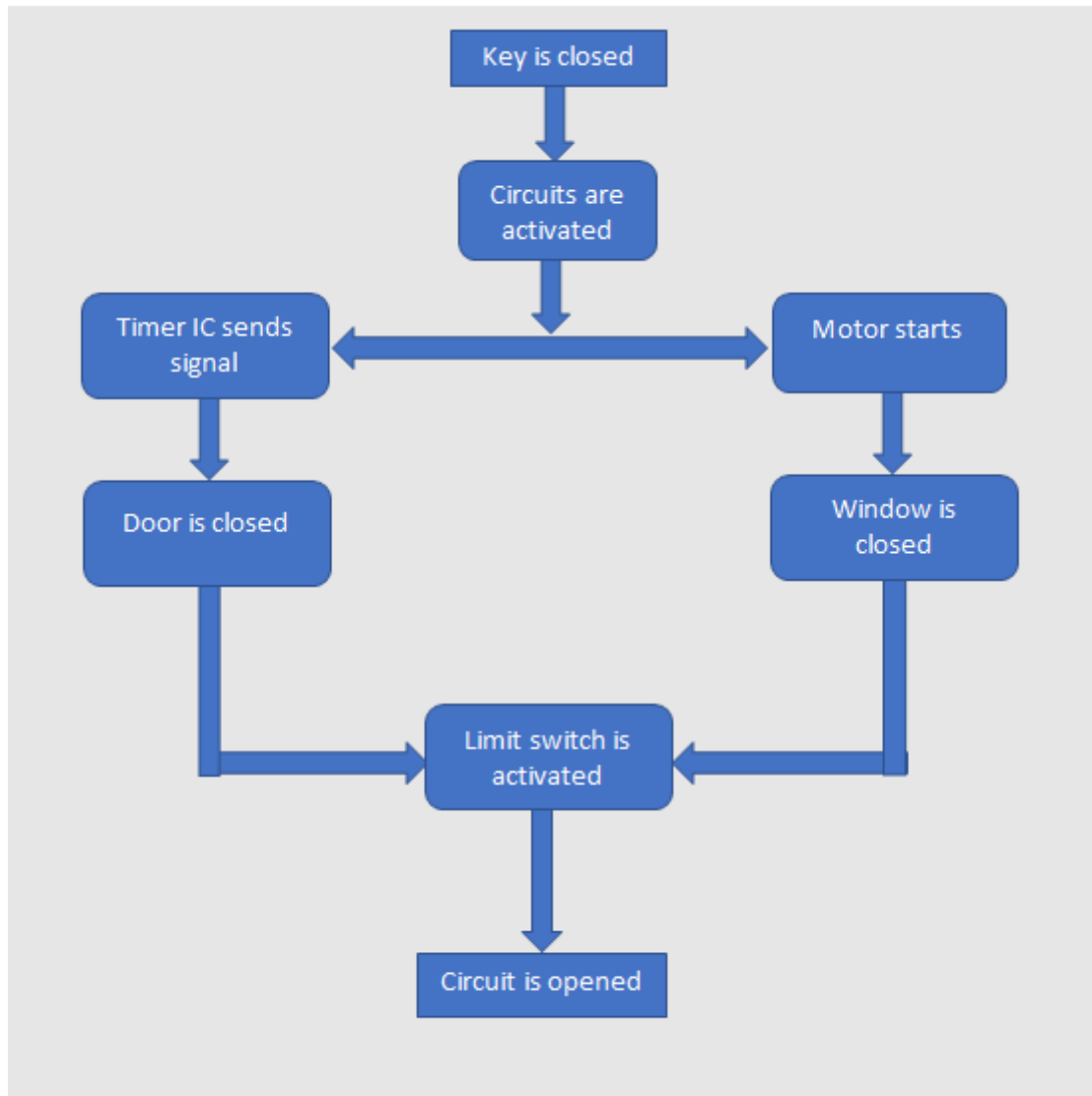


Fig. 1.Flowchart of the operation

Fig.1. depicts the logical flow of the system. It represents the different tasks that take place during the operation.

3. DESIGNING

Design and Mechanism of Window.

In our model, the frame, the door, and the widow are made of wood.

Components used:

1. Motor with gearbox- 300 rpm
2. Power supply- 9 V
3. Limit switch
4. Gear and gear rack

The theory of the hardware and design circuit automatic sliding window is very simple. When we press the key, the circuit is closed. The motor is thus activated causing the window to close. Once the window is fully closed, the limit switch cuts off the power supply to the motor and it stops running causing the window to stop moving. The motor was suitably chosen to move the one window from one end to the other. The motor receives power supply from the 9 V battery.

Door Designing

Components Used:

1. Servo Motor (SG 90 Tower Pro)

Specifications:-

- i. Operation Voltage: 4-9V.
- ii. Torque: 1.8 kg-cm at 4.8V.
- iii. Speed: 0.10 sec/60 degree.
- iv. Weight: 9 grams.
- v. Gear Type: Plastic.
- vi. Rotational Range: 180 degrees

2. NE555 Timer IC

Used as an astable multivibrator.

3. Preset – 100K.
4. Resistors – 56K, 3.3M.
5. Capacitor – 22nF.
6. Diode – 1N4148.

Working:

We are using the servo motor to control the closing motion of the door. The signal to the servo motor is given by the 555 IC. The 555 timer IC is used in astable mode to generate a frequency with a low duty cycle in order to control a single servo motor (90+)[3]. The angle of rotation of the servo motor depends on the width of the time pulse which is obtained from the IC 555 and also the servo motor requires a signal input at every (20ms) [4]. Hence, the IC 555 is configured as astable multivibrator. Different duty cycles can be obtained by changing the resistance which will lead to change in motor speed; however the frequency would be same (19Hz) [3]. The arm of the servo motor is connected to the door. When the key is closed the circuit is activated and timer IC sends the output pulse to the signal input of the servo motor. At the end of the output pulse the servo motor arm rotates which in turn rotates the door attached to the arm and hence closes the door.

4.FIGURES



Fig.2. The designed complete Assembly

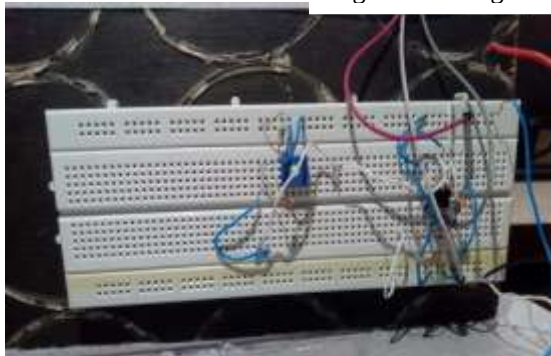


Fig.2.B.I. Circuit

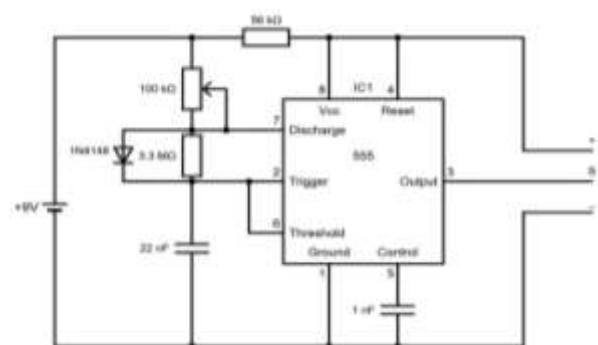


Fig.2.B.II Circuit Diagram

Fig.2.A represents the entire home assembly along with the circuit connections.

Fig.2.B. represents the circuit constructed on breadboard while Fig.2.B.II represents the circuit diagram of the connections made.

5. TESTING

The assembly was tested and it worked successfully and gave the desired results. When the key was inserted and turned, the circuit was completed and the motors started operating, closing the window and door. The rack and pinion gear used converted the rotary motion into translatory and the servo motor used moved the door through the required angle. Thus, after the closing of the systems, the limit switch got operated which resulted in opening of the circuit. Thus the desired outcome was obtained.

6. RESULTS AND DISCUSSION

Fig 3, 4 and 5 provides the pictorial demonstration of the different operations.



Fig. 3. Key operation on main door



Fig. 4(a). Open window initially



Fig. 4(b). Window closes after key is turned



Fig. 5(a). Open door initially



Fig. 5(b). Door closes after key is turned

7. CONCLUSIONS

The assembly made can be extended to the whole house and also to the different firms like colleges, banks etc. With just a single key the entire buildings doors and windows can get closed this would reduce human efforts and errors to great extent. Not only that, it would also ensure security. This automation can be further extended to close the electrical appliances like lights, fans, heater etc. to save electricity. However, the structure and design will have to be modified as per the larger length scale. Hence, it in order to install such mechanisms it would lead to increase the initial cost but on the other side the maintenance cost would be low with enhanced security.

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