Luggage Security Alarm Ciruit Using Logic Gates

A mini-project report submitted for

Digital Circuit Design (Semester III)

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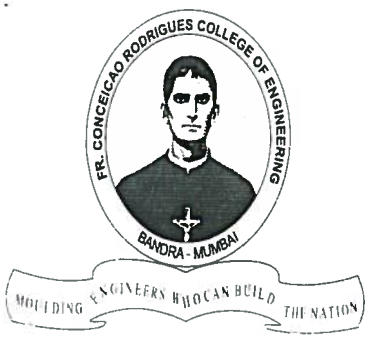

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Luggage Security Alarm Circuit Using Logic Gates

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Abstract

During our journey through train and bus, we carry many important things and all the time we have fear that someone might lift our luggage. So to protect our baggage, we normally lock our baggage through old ways by the help of chain and lock. After all locks, we still remain in fear that someone may slash the chain and take away our valuable material. To overcome with these fear, here is an easy circuit which is based on the NAND gate. In this circuit, when someone tries to lift your luggage, it will generate a warning alarm which is very much helpful during your travel in the bus or train.

Another application of this circuit is that you can employ these into your house so to avoid the attempt of robbery in your house with the help of this alarm circuit. When anyone tries to open the door of your house, loop break down and sound from the alarm produce.

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1. Introduction

The basic building block of this circuit is IC 74LS00 along with some other components viz. resistors, capacitor along with transistor and buzzer which is used to save your important things from robbery with the help of this easy circuit. It produces a warning beep, when someone tries to unlock the lock as an effect of its wire loop will split and alarm is produced.

2. Brief explanation of the project

2.1 Circuit diagram

2.2 Components

IC 74LS00: 74LS00 is a low power Schottky series of Integrated Circuit.74LS00 IC is a Quad 2-Input NAND Gate that contains four independent gates each of which performs the logic NAND function. It is a 14-pin package having 4 gates, each with 2 input pins, 1 output pin.The power supply required is +5V. For most of the 7400 chips, pin 7 is the ground (GND) connection and pin 14 is the +5V power supply.

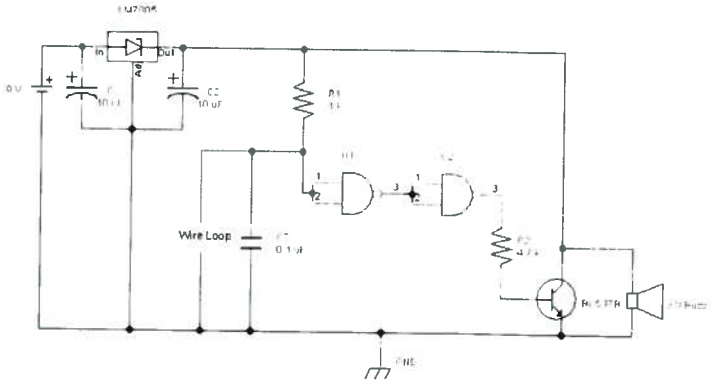

Figure 1. Circuit Diagram

Resistors: Resistor is a passive component used to control current in a circuit. Its resistance is given by the ratio of voltage applied across its terminals to the current passing through it. Thus a particular value of resistor, for fixed voltage, limits the current through it. They are omnipresent in electronic circuits.The different value of resistances are used to limit the currents or get the desired voltage drop according to the current-voltage rating of the device to be connected in the circuit.The circuit makes use of 1 KΩ and 4.7 KΩ resistors.

Capacitors: Capacitor is a passive component used to store charge. Capacitors offer infinite reactance to zero frequency so they are used for blocking DC components or bypassing the AC signals. Capacitors are used for smoothing power

supply variations.Capacitors may be non-polarized/polarized and fixed/variable. Electrolytic capacitors are polarized while ceramic and paper capacitors are examples of non polarized capacitors. Here 0.1 μF capacitor is used in the security circuit and two 10 μF capacitors are used across voltage regulation circuit.

IC7805: Voltage regulator IC's are the IC's that are used to regulate voltage. IC 7805 is a 5V Voltage Regulator that restricts the voltage output to 5V and draws 5V regulated power supply. It comes with provision to add heatsink. The maximum value for input to the voltage regulator is 35V. It can provide a constant steady voltage flow of 5V for higher voltage input till the threshold limit of 35V.

BC547: BC547 is an NPN Bi-polar junction transistor (BJT). A transistor, stands for transfer of resistance, is commonly used to amplify current. A small current at its base controls a larger current at collector & emitter terminals. Together with other electronic components, such as resistors, coils, and capacitors, it can be used as the active component for switches and amplifiers. The transistor terminals require a fixed DC voltage to operate in the desired region of its characteristic curves.

Buzzer: Buzzer is an electrical device that makes a buzzing noise and is used for signalling. This circuit makes use of 3V Buzzer for signalling breakage of loop.

2.3 Working of the project

Input		Output
A	B	$Y=\overline{A.B}$
0	0	1
0	1	1
1	0	1
1	1	0

Figure 2. Truth Table

The circuit works on the truth table of NAND gate i.e. when any of the input states or both the input states go to the LOW state in the NAND gate, then the output will be HIGH and if both the inputs are at HIGH state, then the output will be LOW in that case.

Output is based on the voltage on pin 1. At the time when power supply is attached to the circuit pin 1, voltage is at zero as loop is unbroken. Hence at pin 3, voltage is HIGH which is coupled with pin 4 and pin 5 which is also at HIGH state. As from the truth table of the NAND gate that if both the inputs are at HIGH state, then the output is LOW hence at the pin 6 of gate 2, we get LOW, due to this, transistor linked to circuit via a resistor will not get base current and the buzzer will not receive voltage. This implies that our baggage is secure.

Now suppose that someone attempt to take your baggage then the loop attached to it broken down. At the time loop break down, pin 1 as well as pin 2 shift to HIGH. Hence at pin 3, voltage is LOW which is coupled with pin 4 and pin 5 which is also at LOW state due to which pin 6 reaches to HIGH state and transistor begin its conduction and buzzer starts beeping. And the alarm will not stop till the time we once again interact with the loop.

2.4 Photograph of project

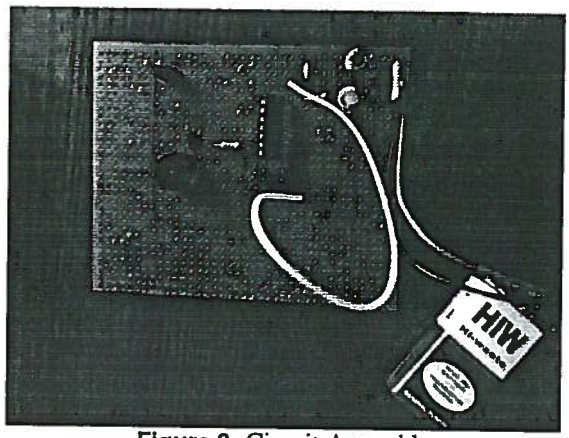

Figure 3. Circuit Assembly

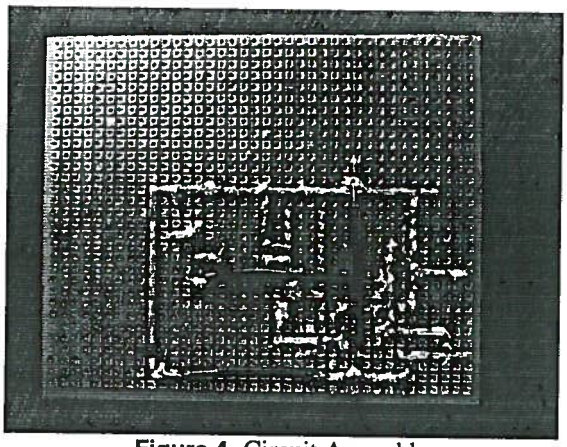

Figure 4. Circuit Assembly

3. Debugging

Circuit Input Voltage = 9 Volts.
Voltage Across IC 74LS00 = 5 Volts.

4. Applications

It can be used for detection of luggage in trains or buses to avoid loss.
It can be used while placing luggage in clock room or hotel.
It can be used while travelling long distance on vehicles to know the luggage is on place.
It can be used in door locks to avoid entry of any intruder in our absence.
It can be used at backyard or farm to avoid entry of any animal.

5. Advantages and Disadvantages

Advantages: The advantages of luggage security alarm system is that it can be operated with 5V, so the power consumption is very less.
Another advantage is that it is portable while traveling because it has fewer components.

Disadvantages: The disadvantages of luggage security alarm system is that the sound of alarm is very low so it will not help if the person is far away from the system. It can be enhanced by interfacing appropriate component to increase the amplitude of sound.
Another disadvantage is that it work on DC supply, so if someone wants to use it on AC supply, further modifications need to be done to convert AC power supply to low DC power.

6. Future scope

It can also be used in fences and line of controls to avoid entry of intruders.
It can be used in security systems, providing very cheap and reliable system.

References

[1] http://www.electronicshub.org/luggage-security-alarm-project circuit/.

[2] https://en.wikipedia.org/wiki.

Appendix

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