GOVERNMENT TECHNOLOGICAL COLLEGE

DEPARTMENT OF ELECTRONIC

ENGINEERING

SOUND SWITCH CIRCUIT

BY

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(PROJECT REPORT)

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MONYWA

We certify that we have examined for acceptance a project report entitled ' **SOUND SWITCH CIRCUIT'** submitted by **Group L (October,2006)** in partial fulfillment of the requirements for the certificate of Electronic Engineering.

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CHAPTER 1

INTRODUCTION

In sound operated switch circuit, non-inverting amplifier of 741 IC is used as mic preamplifier, 555 timer IC as monostable mode, 4027 IC as JK flip-flop and one darlington pair to two transistors to drive the relay to switch on/off the load. A mic or a speaker is operated by receiving the incoming signal and a LED at pin 6 of 741 IC is allowed someone to know whether the mic is properly received the incoming signal or not.

This circuit can be used to switch on/off the some electrical appliances by sound signal. For example, someone in bed can easily switch on radio, cassette, TV or fan by first clapping and switch off them by next clapping.

CHAPTER (2)

THEORIES OF COMPONENTS

2.1 4027(Dual JK flip-flop) IC

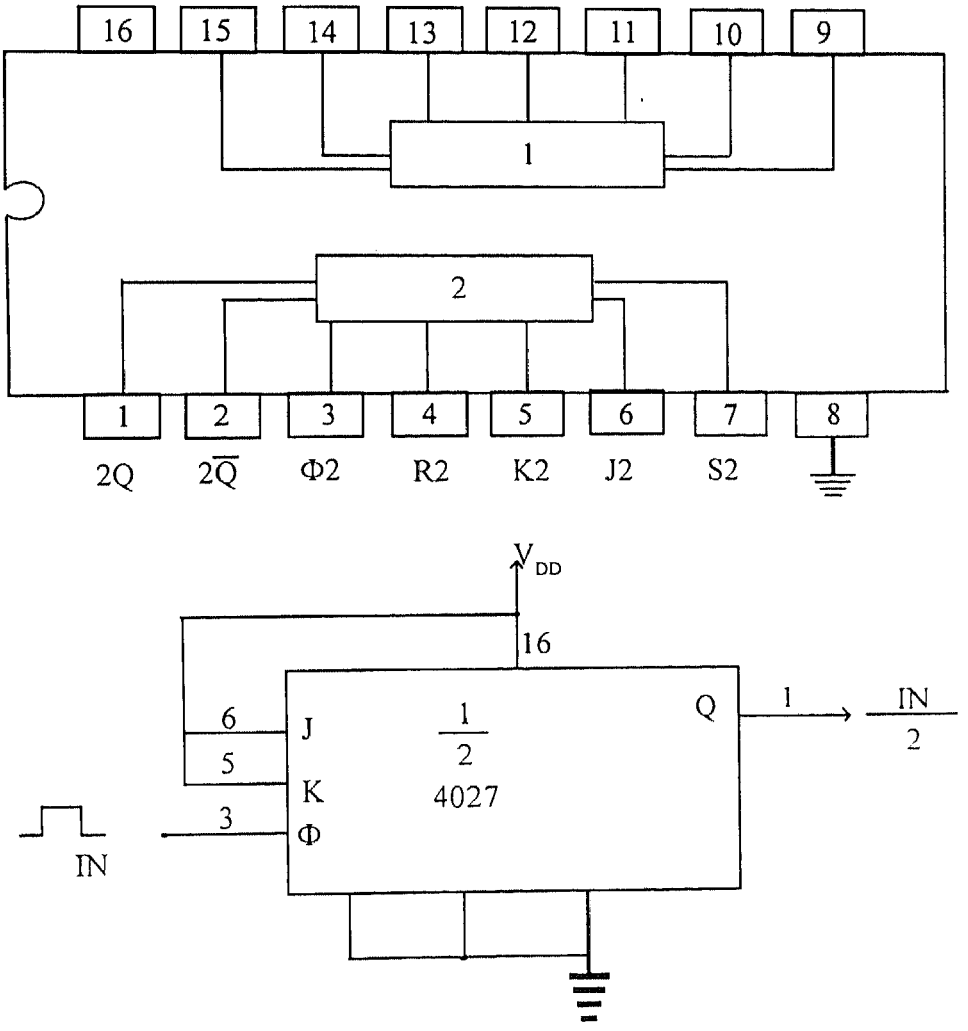

Fig . The Edge Triggered J-K Flip-Flop

2.1.1 The Edge-Triggered J-K Flip-Flop

The J-K flip-flop is versatile and is perhaps the most widely used type of flip-flop. The J and K designations for the input have no known significance except that they are adjacent letters in the alphabet.

The functions of the J-K flip-flop is identical to that of the S-R flip-flop in the SET, RESET and no-change conditions of operation. The difference is that the J-K flip-flop has no invalid state as does the S-R flip-flop.

2.2 The 555 Circuit

The 555 is a general-purpose IC that can be used for precision timing, pulse generation, sequential timing, time delay generation, pulse width modulation, pulse position modulation and linear ramp generation. The 555 can operate in both astable and monostable modes, with timing pulses ranging from microseconds to hours. It also has an adjustable duty cycle and can generally source or sink output currents up to 200 mA.

2.2.1 Basic operation

The basic block diagram of the 555 IC is shown in Figure. The circuit consists of two comparators which as RS flip-flop, an output buffer, and a transistor that discharges an external timing capacitor.

The RS flip-flop is a digital circuit that will be considered in detail in a later chapter. Here, we will only describe the basic digital function of the flip-flop, so that the operation of the 555 timer can be explained. When input R is high and input S is low, outpu Q is high. The complementary state occurs when R is low and S is high, producing at low Q output. It both R and S are low, then output Q remains in its previous state.

Comparator I is called the threshold comparator, which compares its input with an internal voltage reference set at (2/3)V by the voltage divider R_3, R_4 and R_5 when the input level exceeds this reference level, the threshold comparator output goes high, producing a high output at flip-flop terminal Q. This turns the discharge transistor on and an external timing capacitor (not shown in this figure) starts to discharge.

The internal control voltage node is connected to an external terminal. This provide external control of the reference level, should the timing period need to be modified. When not in active use, this terminal should be by passed to ground with a 0.01μF capacitor, to improve the circuit's noisy immunity.

Comparator 2, called the trigger comparator, compares its input trigger voltage to an internal voltage reference set to (1/3)V by the same voltage divider as before. When the output trigger level is reduced below this reference level, the trigger comparator output goes high, causing the RS flip-flop to reset. Output Q goes low and the discharge transistor turns off. This comparator triggers on the leading edge of a negative going input pulse.

The output stage of the 555 IC is driven by output Q of the RS flip-flop. This output is usually a totem-pole push-pull circuit, or a simple buffer, and is generally capable of sourcing or sinking 200 mA.

An external reset input to the RS flip-flop overrides all inputs and is used to initial a new time cycle by turning the discharge transistor on. The reset input must be less than 0.4 V to initiate a reset. When not actively in use, the reset terminal should be connected to V to prevent a flase reset.

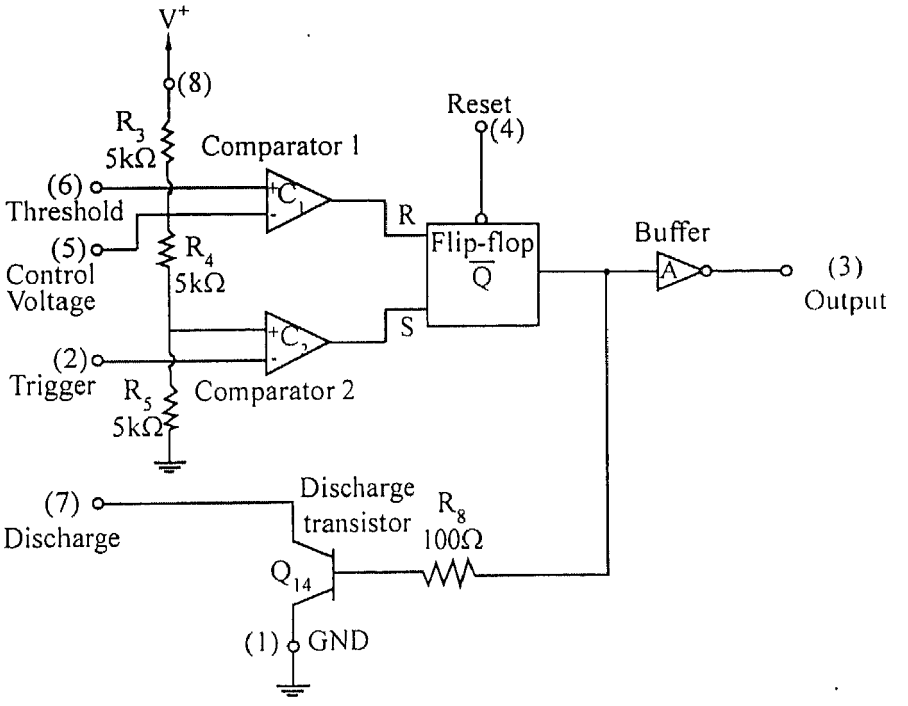

Fig. Basic block diagram, 555 timer circuit

2.2.2 Monostable Multivibrator

A monostable multivibrator, also called a one-shot, operates by charging a timing capacitor with a current set by an external resistance. When the one-shot is triggered, the charging network cycles only once during the timing interval. The total timing interval includes the recovery time needed for the capacitor to charge up to the threshold level.

The external circuitry and connections for the 555 to be used as one-shot multivibrator are shown in Figure. With a high voltage V applied to the trigger input, the trigger comparator output is low, the flip-flop output Q is high, the discharge transistor is turned on, and the timing capacitor C is disacharged to nearly ground potential. The output of the 555 circuit is then low, which is the quiescent state of the one-shot.

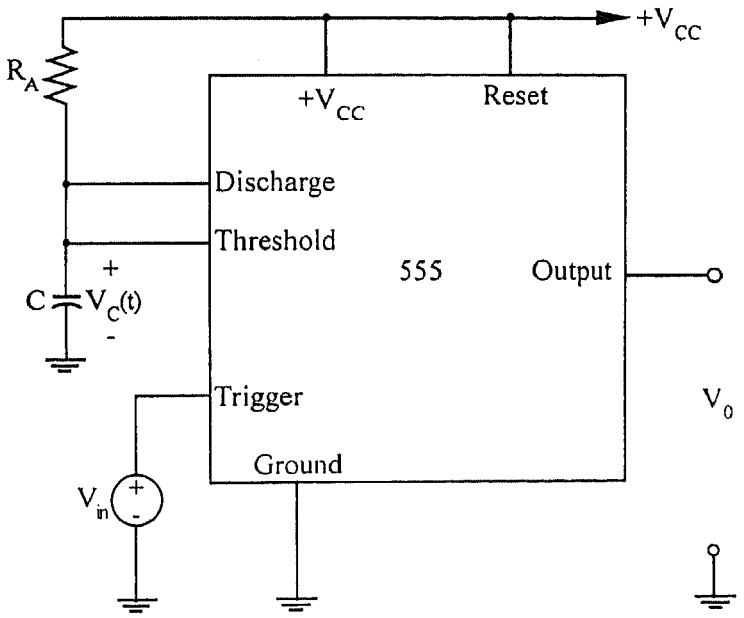

Fig. The 555 circuit connected as a monostable multivibrator

When a negative going pulse is applied to the trigger input, the output of the trigger comparator goes high when the trigger pulse drops below (1/3)V. Output Q goes low, which mans that the output of the 555 goes high, and the discharge transistor turns off. The output of the 555 remains high even if the trigger pulse returns to as initial high value, because the reset input to the flip-flop is still low. The timing capacitor charges up exponentially towards a final value of V through resistor R.

2.2.3 Circuit And Operation

If someone creates the voice signal by clapping or speaking, the voice passes trought the air and so has to vibrate the diaphragm of the speaker according to the movement of the sound wave. Consequently, the speaker coil which is in the magnetic field becomes movement. This movement results the signaling pulse at pin (3) of 741 IC and amplifiers it. Preset resistor (10k) can be adjused to get zero volt at the output (pin 6) before receiving the signal. One LED at this output is one when the mic (or) speaker receives the incoming signal and off when there is no incoming signal. By 0.1μF coupling capacitor, the amplified incoming voice signal is connected to the triggering input (pin 2) OF 555 Timer IC. Because this IC is operated as monostable mode, the output has high level as soon as the incoming signal is received and takes the time 1.1 RC. Here, the timing resistor and capacitor are 100kΩ and 10μF. Therefore, the time period which the high level stands is only 1.1 sec and the output becomes low after 1.1 sec.

The output of the timer is directly connected to the clock input (pin 3)of the dual JK flip-flop 4027 IC. Pin 5 and 6 of this flip-flop IC are connected to supply voltage and set and reset input (pin 4 and 7)are grounded. The output signal (pin 1) is vearied by the amplified incoming signal at the clock input. When the output of timer is high, the clock input and output of flip-flop are also high. This high level output switches on the Darlington transistor pair and makes operate the relay to switch on the load.

The high level output of flip-flop does not change until its input receives the next signal whereas the output of timer becomes low after 1.1 sec. By the time the next incoming is received, the output of timer change high level and result if low output at the flip-flop. Then this output cuts off the transistors, switches off the relay, and the load is OFF.

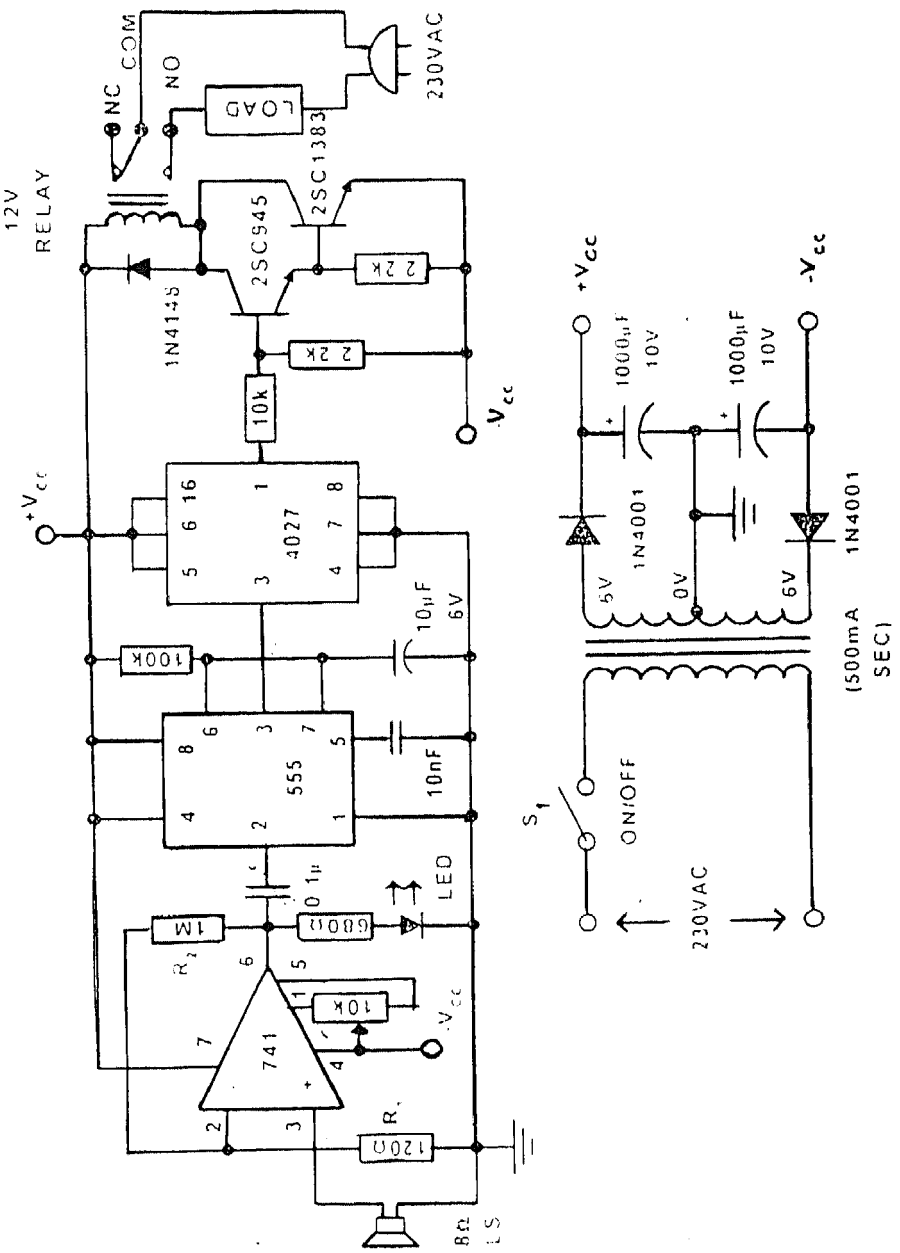

Figure. Circuit diagram of sound operated switch and needed power supply circuit

CHAPTER 3

CONCLUSION

In this project, we designed and constructed to switch on/off the home electrical appliances. In designing our project, we emphasized to choose means by which the required parts of circuit are available in local as much as possible.

In this circuit, the incoming signal from the mic or speaker is amplified by the mic preamplifier and triggered to input of timer IC (555 IC).

The output of the timer IC is inputted to J-K flip-flop as clock pulse.

The output low/high level from the J-K flip-flop can cause the switching on/off the relay driver transistors. Then this can switch on/off the electrical appliances by operating or not the relay.

The power supply circuit needed for the circuit is supplied together with this circuit.