CLAPPING SWITCH USING IC 555

by ANUSHA S

TITLE

“CLAPPING SWITCH USING IC SSL’

A MINI PROJECT REPORT

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ABSTRACT

Sound operated switch is one of the interesting applications of 555 timer IC. The circuit uses a 555 timer IC and transistor BC547 for its operation. The electrets microphone is used to provide the pulse to the 555 timer. The operation is simple. Clap and the lamp turns on. Clap again it turns off. The electrets microphone picks up the sound of your claps, coughs, and the sound of that knocked off the table. It produces a small electrical signal which is amplified by the succeeding transistor stage. Two transistor cross connected as a bistable multivibrator change state at each signal. One of these transistors drives a heavier transistor which controls a lamp.
The transistor type is not critical and any n-p-n silicon transistors can be used.

CHAPTER 01

INTRODUCTION

The clapping switch is a beginner project that runs with the IC 555 timer. Its application is interesting because we can turn it on and off simply by applauding. Simply lying in bed, we can even turn the light on and off. The circuit provided in this report is the simp lest and most economical circuit for a clap switch. Since it uses a simple condenser microphone to produce the pulse signal, no more voltage is needed. It can be used to control the ornamental spoke circuit.

The applause switch is an interesting hobby circuit that turns on the lights with a clapping sound. Although its name is "Clap switch", it can be activated with any sound in the same tone as Clap. The main component of this ap ause circuit is the electric condenser microphone, which was used as a sound sensor. The condenser microphone basically converts sound energy into electrical energy, which in turn is used to activate the IC 555 timer, via a transistor. And activating the 555 IC would turn on the LED, which will turn off automatically after a while. I made this circuit as simple as possible, you can find many complex Clap switches (using SSS IC) with some extra components, and simply doing the same. Even simplifying things requires more effort than making it complex.

CHAPTER 02 LITERATURE SURVEY

O Clap Switching

This paper proposed by Somangshu Bagchi, Subhadip Ghosh, Deepak Nandi present a clap switching work prior to November 2013.

In this project it gives knowledge of 555 timers, i.e. working of relay and clocks. In this type of device, it provides the working of NE555 timer and the relay. The relay is switch it gives a path only when current flown through it. In this project the second timer triggers relay of conducting path it is established terminals of the load and the device is gets turned on. Time interval of the claps is checked with the time constant and it can be established by the RC configuration of T=1.1R7*C3.

O Control of Light and Fan with Whistle and Clap

This paper pr osed by Kashinath Murmu and Ravi Sonkar.

It presents a Control of Light and Fan with Whistle and Clap work prior accepted in November 2004. In this paper, it can detect clap and whistle properly by removing most of the noise. But it complicated to distinguish between clap and tap on a table with the analog circuits due to similar waveform generated by it.

0 Design of a clap activated switch

This paper is published by Seyi Stephen olokede work prior accepted in JulyDecember 2008.

In this paper the clap activated switching device function properly by responding to both hand claps at about three to four meter away and finger tap sound at very close range, since both are low frequency sounds and produce the same pulse wave features. The resulting device is realizable, has good reliability and its relatively inexpensive.

0 Inferring the hand configuration from hand clapping sounds

[10]

The "Antti Jylha and cumhur Erhut has been developed a paper in September 2008 in the 11th international conference on digital effects, Espoo, Finland.

In this paper, it is possible to make inference of the hand configuration of the clapper given the result in sound. Result also suggest that the clap of individual clappers may incorporate systematic differences from other people's claps, both the personification and clapper independency of the proposed systems should be studied.

CHAPTER 03

PROPOSED METHODOLOGY

1. The basic principle of clap switch is that it converts sound signal into electrical energy.
2. The input component is a transistor that receives clap sound as input and converts it to electrical pulses. The basic idea of a clap switch is that the electric microphone picks up the sound of your clap,coughs,and the sound of the the table.
3. This circuit is constructed using basic electronic components like resistor, transistors, battery,capacitors.This circuit turns 'ON' light for the first clap.The light turns on UII the next clap. The light turns on UII the next clap. For the next clap the light turns off. This circuits with a 9v votlage hence a cv battery are employed.

CHAPTER 04

PROJECT DISCRIPTION

COMPONENTS DETAILS

O RESISTOR:

FIGURE 1: RESISTOR

A linear resistor is a two-terminal linear passive electrical component that implements electrical resistance as a circuit element. The current through a resistor is directly proportional to the voltage *across* the resistance terminals. Therefore, the ratio between the voltage applied across the terminals of a resistor and the intensity of the current through the circuit is called resistance. This relationship is represented by Ohm's law:

V = I X R ....EQUATION (1)

Resistors are common elements in electrical networks and electronic circuits and are ubiquitous in most electronic equipment. The practical resistances can consist of various compounds and films, as well as of a resistance wire (wire of a high resistivity alloy, such as nickel chromium). Resistors are also implemented within integrated circuits, particularly analog devices, and can also be integrated into hybrid and printed circuits.

The electrical functionality of a resistor is determined by its resistance: common commercial resistors are produced in a range of over nine orders of magnitude. When this resistance is specified in an electronic project, the required precision of the resistance may require attention to the manufacturing tolerance of the chosen resistance, based on its specific application. The temperature coefficient of resistance can also be a problem in some precision applications. The practical resistances are also specified as having a maximum nominal power that must exceed the expected power dissipation of this resistance in a particular circuit: this is mainly worrying in the applications of power electronics. Resistors with higher powers are physically larger and may require heat sinks. In a high voltage circuit, it is sometimes necessary to pay attention to the maximum rated working voltage of the resistor.

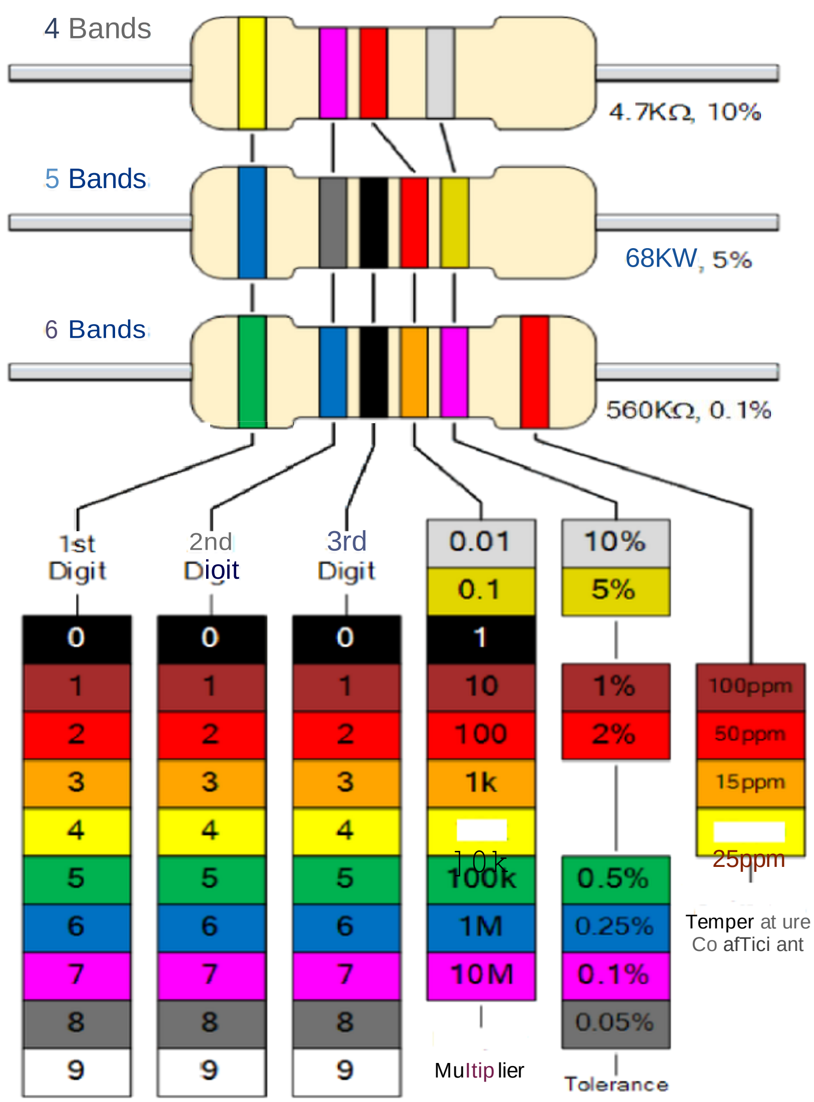

FIGURE 2: COLOR CODING OF THE RESISTORS

0 CONDENSER MICROPHONES

FIGURE 3: CONDENSER MICROPHONE

Condenser means condenser, an electronic component that stores energy in the form of an electrostatic field. The term capacitor is really obsolete, but it has been pasted as the name of this type of microphone, which uses a capacitor to convert acoustic energy into electrical energy. Condenser microphones require power from a battery or external source. The resulting audio signal is a stronger signal than a dynamic signal. Capacitors also tend to be more sensitive and receptive to dynamics, which makes them very suitable for capturing subtle nuances in a sound. Then are not ideal for large volume work, because their sensitivity makes them prone to distortion.

How condenser microphones work*

A capacitor has two plates with a voltage between them. In the condenser microphone, one of these plates is made of very light material and acts as a diaphragm. The diaphragm vibrates when it is hit by sound waves, changing the distance between the two plates and, therefore, changing the capacity. In particular, when the plates are closer together, the capacity increases and a charging current occurs. When the plates are more separated, the capacity decreases and a discharge of current occurs.

To function, a voltage through the capacitor is required. This voltage is supplied by a battery in the microphone or by an external phantom source

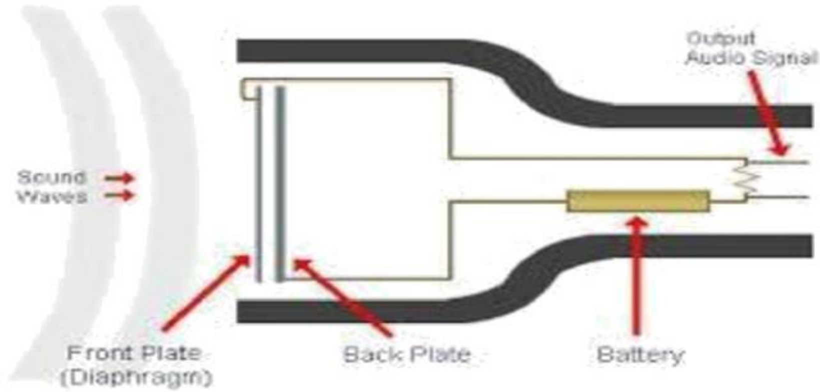

FIGURE 4: CROSS SECTION OF A TYPICAL CONDENSOR MICROPHONE

0 CAPACITOR

FIGURE 5: ELECTROLYTIC CAPACITOR FIG URE 6: CERAMIC CAPACITOR

A capacitor is a bit like a battery. Although they work in completely different ways, capacitors and batteries store electricity. One battery has two terminals. Inside the battery, chemical reactions produce electrons in a terminal and absorb electrons in the other terminal. A capacitor is much simpler than a battery, since it cannot produce new electrons, but only stores them. Inside the capacitor, the terminals are connected to two metal plates separated by a nonconductive or dielectric substance. We can easily make a capacitor from two pieces of aluminum foil and a sheet of paper

The dielectric can be any non-conductive substance. However, practical for applications, specific materials are used that best fit the function of the condenser. Mica, ceramics, cellulose, porcelain, Mylar, Teflon and even air are some of the non-conductive materials used. The dielectric determines which type of capacitor is and which one fits best. Depending on the size and type of dielectric, some capacitors are better for high frequency applications, while others are better for high voltage applications. Capacitors can be manufactured for any purpose, from the smallest plastic capacitor of the calculator, to an ultracapacitor that can power a commuter bus. NASA uses glass capacitors to help reactivate the space shuttle circuits and help distribute space probes. These are some of the various types of capacitors and how they are used.

Air: often used in radio tuning circuits

Myla r: most commonly used for timer circuits such as clocks, ala rm clocks and meters

Glass: good for high voltage applications

Ceramics: used for high frequency purposes such as antennas, X-ray machines and magnetic resonance

Super capacitor: electric and hybrid electric cars

0 BC547 TRANSISTOR

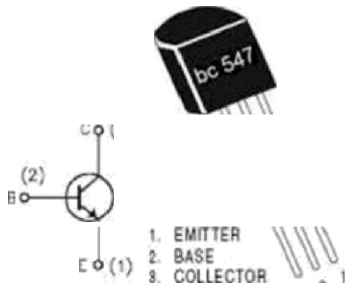

FIGURE 7: TRANSISTOR BC547

The BC547 transistor is an NPN silicon epitaxial transistor. The BC547 transistor is a generalpurpose transistor in small plastic packages. It is used in the commutation and amplification of transistors for general use BC847 / BC547 series 45 V, 100 mA NPN for general use.

The BC547 transistor is an NPN bipolar transistor, in which the letters "N" and "P" refer to the majority load carriers within the different regions of the transistor. Most of the bipolar transistors used today a re NPN, since the mobility of electrons is greater than the mobility of holes in semiconductors, which allows higher currents and faster operation. The NPN transistors consist of a semiconductor layer doped with P (the "base") between two layers doped with N. A small current that enters the base in a common emitter mode is amplified at the outlet of the collector. In other words, an NPN transistor is "on" when its base is high with respect to the emitter. The arrow on the NPN transistor symbol is located on the emitter's leg and points in the direction of conventional current flow when the device is in alive forward mode. A mnemonic device to identify the NPN transistor "not pointing" symbol. An NPN transistor can be considered as two diodes with a shared anode region. In normal operation, the emitter base junction is polarized forward and the junction of the base collector is inversely polarized. In an NPN transistor, for example, when a positive voltage is applied to the junction of the base emitter, the balance between thermally generated carriers and the repellent electric field of the emptying region is unbalanced, allowing thermally excited electrons to be injected into the region bastc These electrons wander (or "spread") through the base from the high concentration region near the emitter to the low concentration region near the collector. The electrons in the base are called minority carriers because the base is p-type doped, which would make the holes the majority bearer in the base

0 ss5 TIMER

FIGURE8: THE 555 TIMER

IC TIMER IC 555 is an integrated circuit widely used to generate precise synchronization pulses. It is an 8-pin IC timer and mainly has two operating modes: monostable and astable. In monostable mode, the pulse delay time can be precisely controlled by an external resistor and a capacitor, while in stable mode the frequency and duty cycle are controlled by two external resistors and a capacitor. 555 is very commonly used to generate time and pulse delays. The IC timer 555 is an incredibly simple but versatile device. It has been around for many years and has been reworked in different technologies. The two main versions of today are tne original bipolar design and the latest CMOS equivalent. These differences matnly concern the quantity of energy required and the maximum operating frequency; They are compatible and functionally interchangeable pins The IC timer 555 is an integrated circuit (chip) used in a variety of timer, pulse generation and oscillator applications. The piece is still widely used, thanks to its ease of use, low price and good stability.

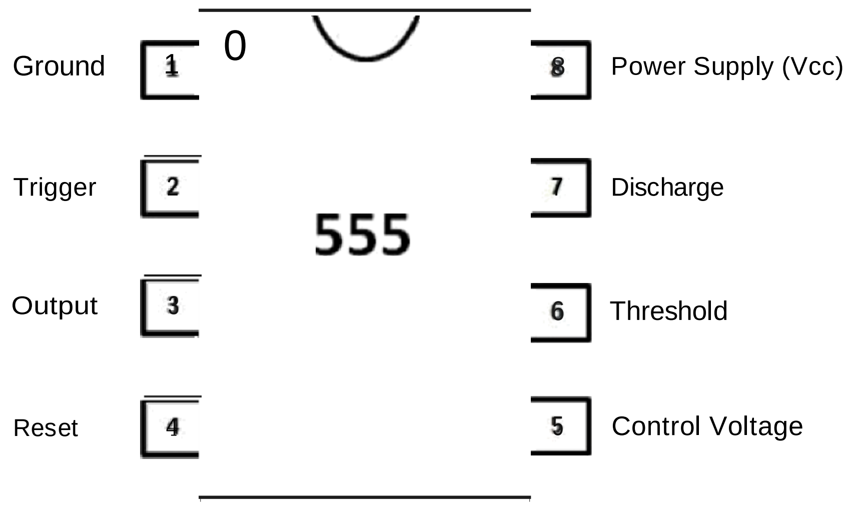

FIGURE 9: PIN DIAGRAM OF SSS TIMER

The connection of the pins for a DIP package is as follows:

Pin	Name	Purpose
1	GND	Ground, low level (0 V)
2	TRIG	OUT rises, and interval starts, when this input falls below 1/3 VCC.
3	OUT	This output is driven to +VCC or GND.
4	RESET	A timing interval may be interrupted by driving this input to GND.
5	CTRL	"Control" access to the internal voltage divider (by default, 2/3 VCC).

? The 555 has three operating modes:

• Monostable mode: in this mode, the 555 functions as a "one-shot" pulse generator. Applications include timers, missing pulse detection, bounce free switches, touch switches, frequency divider, capacitance measurement, pulse-width modulation (PWM) and so on.

• Astable — free running mode: the 555 can operate as an oscillator. Uses include LED and lamp flashers, pulse generation, logic clocks, tone generation, security *a\arms,* pulse position modulation and so on. Selecting a thermistor as timing resistor allows the use of the 555 in a temperature sensor: the period of the output pulse is determined by the temperature. The use of a microprocessor-based circuit can then convert the pulse period to temperature, linearize it and even provide calibration means.

• Bistable mode or Schmitt trigger: the 555 can operate as a flip-flop, if the DIS pin is not connected and no capacitor is used. Uses include bounce free latched switches.

○ LIGHT-EMITTING DIODE

FIGURE 10: LED (LIGHT—EMITTING DIODE)

A light-emitting diode (LED) is a semiconductor ht source. LEDs are used as lights in many devices and are increasingly used for other lights. Introduced as a practical electronic component in 1962, the first LEDs emitted low intensity red light, but modern versions are available through visible, ultraviolet and infrared wavelengths, with very hign power wnen a light emitting diode is polarized (on), the electrons are able to recombine with the holes of tne electrons inside the device, releasing energy in the form of photons.

This effect is called electroluminescence and the color of light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductors. LEDs usually have a small area (less than 1 mm2 nd integrated optical components can be used to model the radiation pattern. [3] LEDs have many advantages over incandescent light sources, including lower power consumption, longer life, greater strength, smaller size, faster switching and longer life and reliability.

LEDs powerful enough for room lighting are relatively expensive and require more precise current and heat management than comparable fluorescent compact lamp sources. The lightemitting diodes are used in different applications such as the replacement of aviation lighting, car lighting (in particular, brake lights, direction indicators and indicators), as well as in road signs. The advantages of the a rementioned LEDs have allowed the development of new screens and text and video sensors, while their high switching speeds are also useful in advanced communication technology. Infrared LEDs are also used in the remote control units of many commercial products, including televisions, DVD players and other appliances.

0 Battery

FIGURE 11: 9V BATTERY

A battery is a device that converts chemical energy directly into electricity. It consists of a series of voltaic cells; Each voltaic cell is regulated by two half-cells connected in series by a conductive electrolyte which contains anions and cations. A half-cell includes the electrolyte and the electrode to which the anions (negatively charged ions) migrate, i.e. the anode or negative electrode; the other half cell includes the electrolyte and the electrode to which cations migrate (positively ionic charged), i.e. the cathode orfe positive electrode. In the redox reaction that powers the battery, cations are eplaced in the anode. The electrodes do not touch, but are electrically connected by the electrolyte. Some ceTTs select two half ceTTs with different electrolytes. A separator between half ceTTs aTTows the ions to flow, preventing the mixing of the electrolytes.

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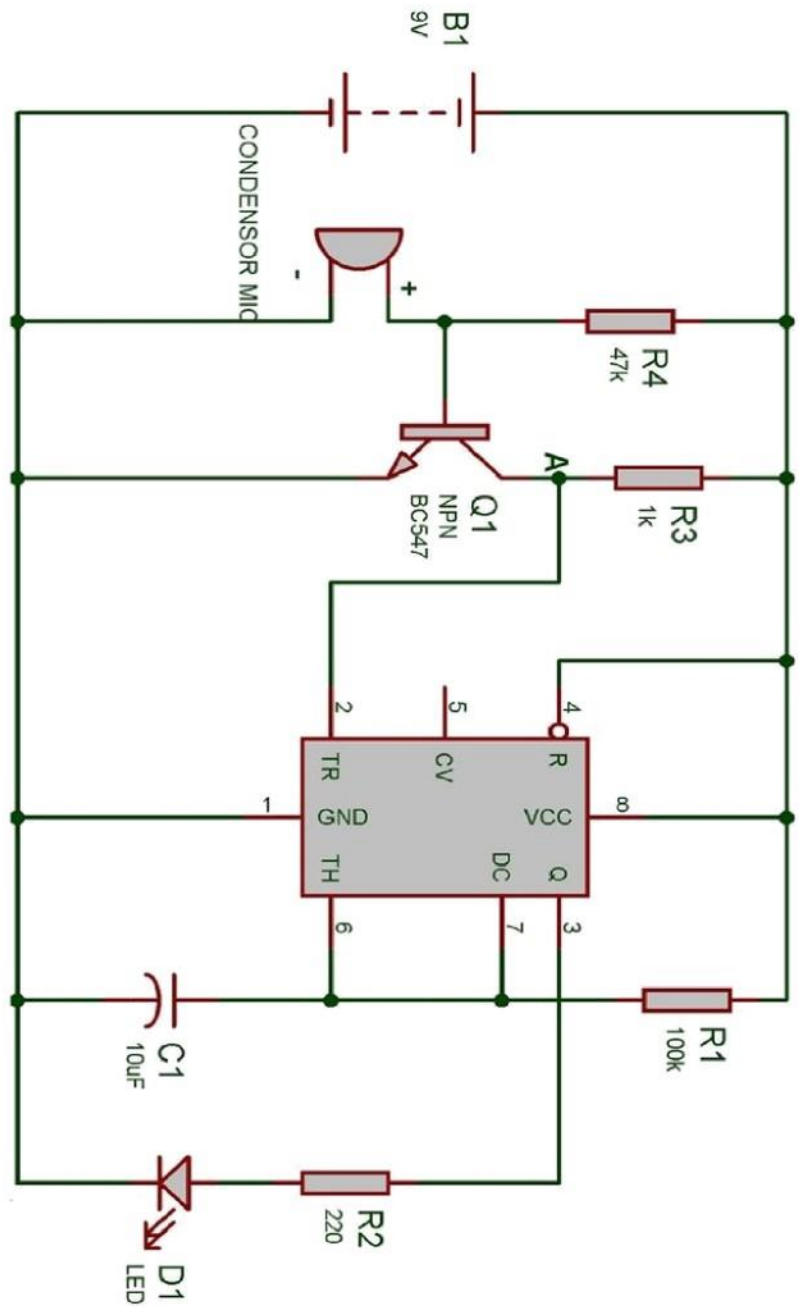

Here we are using Electric Condenser Mic for sensing the sound, transistor to trigger the 555 timer IC and 555 IC to turn ON the LED through a low voltage trigger.

You can view the circuits and connections in the previous schematic diagram of the clap switch.

Initially, the transistor is in the OFF state because there is not enough voltage on the base emitter (0.7 v) to turn it on. And point A has a high potential and point A is connected to pin 2 of trigger IC 555, therefore pin 2 of the trigger also has a high potential. As we know, to activate the IC 555 via the PIN 2 trigger, the voltage of PIN 2 must be lower than Vcc / 3. Therefore, in this phase, the LED is off.

Now, when we produce a sound near the condenser microphone, this sound will become electrical energy and increase the potential in the base, which will turn on the transistor. As soon as the transistor turns on, the potential at point A will become low and will activate 555 IC due to the low voltage (less than Vcc / 3) on the activation pin 2 and the LED will light up. We connected the LED to the output PIN 3 of 555 IC via a 220-ohm resistor.

After a while, the LED will turn off automatically because we are using the 555 IC timer in monostable mode. The LED will remain lit for 1.1 * R1 * C1 seconds. So, we can see, with these formulas, that we can change this duration by changing the value of resistor R1 or/ and capacitor C1. You can change this circuit using the relay to control electronic devices (120/220 V AC). The control PIN S of the timer IC 555 must be grounded via a 0.01uF capacitor. To test this circuit, you need to clap loudly as this small condenser mic don't have long range. Or you can directly hit at the mic lightly

0 <u>OPERATION OF SOUND OPERATED SWITCH</u>

+ Conversion of sound to electrical pulse

Microphones are types of transducers, they convert acoustic energy, i.e. the sound signal. Basically, a microphone consists of a diaphragm, which is a thin piece of material that vibrates when struck by a sound wave. This causes the vibration of other components in the microphone, with consequent variations in some electrical quantities and consequent generation of electric current. The current generated in the microphone is the electrical impulse. This microphone has a built-in amplification stage. The power of this built-in amplifier is provided by connecting a resistance to a photothermic voltage source and the current variations are reflected as voltage variations through this resistance according to the ratio of the family V = T * R. Another large resistance will provide a voltage higher, but then the current in the device is reduced, which reduces the gain.

The polarization of the amplifier: a transistor stage, polarized close to the cut-off (ie almost no current without a signal) amplifies the microphone signal. The microphone output is coupled to the base of the transistor using an electrolytic capacitor (note: the use of a better capacitor here will not work). The top of the electret microphone is a few volts, the base is about half a volt, so the capacitor leakage current (all the electrolytic capacitors here will not work). The top of the electrets microphone is a few volts, the base takes about half a volt. Therefore, the capacitor leakage current (all electrolytic capacitors have a loss of at least a little) will eventually cause a stable state condition in which the capacitor leakage goes to the base terminal of the transistor. Therefore, the collector will have to multiply this loss, which can generally be ignored. However, the first time the microphone output is positive (because someone applauded) this change is completely coupled to the base due to the action of the capacitor. This increases the current through the transistor and this increase in current causes the voltage in the collector, which was close to the supply voltage in the collector, which was close to the supply voltage, to drop almost to zero. If you've applauded loud enough. This is not a high-fidelity audio amplifier. Its function is not to produce outputs for (slightly) larger sounds, so the normal polarization network can be omitted.

Changing State in Clapping, the state of the bistable changes. The output of the amplifier becomes a strong impulse when it passes through a (relatively) low value capacitor of 0.1 microfarad (100 nano-farad). This is connected via steering diodes at the base of the transistor that leads. This transistor stops working and the other transistor has not driven anyway. So, in one applause, both transistors come out. Thus, those two capacitors through the basic resistors go into action. The capacitor that connects to the base of the transistor that was ON has voltage across it. The capacitor that connects to the base of the transistor that was turned off has no voltage across it. When the sound of the applause disappears, both bases increase towards the supply voltage, but due to the difference in the charges of the two capacitors, the base of the transistor that before did not lead first reaches the magic value of half volts. And get and stay. Until the next applause. Two red light-emitting diodes have been placed in the two collector circuits so that this circuit can work on its own. If you cover one LED and show the other in the foreground, you have it there: a light that works with your palms.

CHAPTER 5

APPLICATION OF CLAP SWITCH

The major advantage of a clap switch is that you can turn something (e.g. a lamp) on and off from any location in the room simply by clapping your hands.

The major advantage of a clap switch is that you can something (e.g. a lamp) on and off from any location in the room (e.g. while lying in bed) simply by clapping your hands.

It is involves mobility-impaired person.

It is also used for a light, television, rad io, or simil ar electronic device that the person will want to turn on/off from the bed.

+ **ADVANTAGES:**

1. Energy efficient.
2. Low cost and reliable circuit.
3. Complete elimination of man power.
4. High accuracy

DISADVANTAGES:

The major disadvantage is that it's generally cumbersome to have to clap one's hands to turn something on or off and it's generally seen as simpler for most use cases to use a traditional light switch.

CHAPTER 06

CONCLUSION AND FUTURE SCOPE

O CONCLUSION

The Clap activated switching device function properly by responding to both hand claps at about three to four meters away and finger tap sound at very close range, since both are low frequency sounds and produce the same pulse wave features. The resulting device is realizable, has good reliability and it's relatively inexpensive. Assemble the circuit on a generalpurpose PCB and enclose it in a suitable box. This circuit is very useful in field of electronic circuits. By using some modification, its area of application can be extended in various fields It can be used to raised alarm in security system with a noise, and also used at the place where silence needed.

0 FUTURE SCOPE

1. We can increase the range of this equipment by using better Mic.
2. We can use this as Remote controller.

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