AUTOMATIC BODY SANITIZER MACHINE

Mini Project submitted in partial fulfilment of the requirement for the award of the degree of

BACHELOR OF TECHNOLOGY IN

ELECTRICAL AND ELECTRONICS ENGINEERING

Under the esteemed guidance of

Dr. Anil puppala

By

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CERTIFICATE

This is to certify that the B.Tech Mini Project report entitled **" AUTOMATIC BODY SANITIZER MACHINE"** is a bonafide work done by Mohammad Junaid **(19R15A0207)** D.Shruthi **(18R11A0215),** Raja Tomar **(18R11A0246)** in partial fulfillment of the requirement of the award for the degree of Bachelor Of Technology in **"Electrical and Electronics Engineering"** from Jawaharlal Nehru Technology University Hyderabad during the year 20212022.

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Abstract:

This project is aimed to design ”Automatic body sanitizer dispenser machine based on sensor” .Virus such as COVID-19 are transferable through touch and contact .There are WHO guide lines to clean or sanitize hands regularly to reduce the risk of infection . Dispensing of sanitizer from the bottle would require manual contact. In this project we design a touch-less sanitizer machine to reduce the risk due to contact. The system can sense the proximity with the help of sensor and sends signal to microcontroller. The controller processes the sensor data and actuates the pump and solenoid value. The sanitizer liquid dispenses through mist nozzle.

An automatic sanitizer dispensing machine is automated, non contact, alcohol based sanitizer dispenser, which finds it’s use in hospitals, work places, offices, schools and much more. Alcohol is basically a solvent, and also a very good disinfectant.

The automatic hand sanitizer machine proposed in this project is ultimately expected to contribute the contactless disinfection in public and virus infection prevention. Additionally, it is economical and eco-friendly.

Keywords:

Relay, PIR motion sensor, diode 1N4007, NPN transistor, submersible water pump…etc.

CHAPTER 1

INTRODUCTION

Sanitizer means cleaning or sterilizing an object or body part like hands or whole body. Sanitization can be done in many ways including UV sanitization, Soap Sanitization, Alcohol Sanitization, Bleach Sanitization and so on. Of the above methods, alcohol was found to be more useful for human beings since it is harmless on skin surface, vaporizes easily and kills most of the viruses, bacteria, and also removes dirt in our hands. Alcohol may be expensive for mass scale sanitization of buildings or rooms and major disadvantage is that, alcohol is highly inflammable and requires careful storage to avoid catastrophe. Alcohol also makes hands dry since it absorbs moisture, and hence also need addition of moisturizers. Alcohol based hand sanitizers are also provided with antiseptic disinfectants like Chlorohexidine Gluconate. Minimum concentration of alcohol in hands sanitizers must be greater than 70% for effectiveness against viruses. But, repeatedly touching the hand sanitizer container to get a drop of sanitizer again initiates contact with person, which may be risky. Hence there is need for non contact based hand sanitizer dispenser.

CHAPTER 2

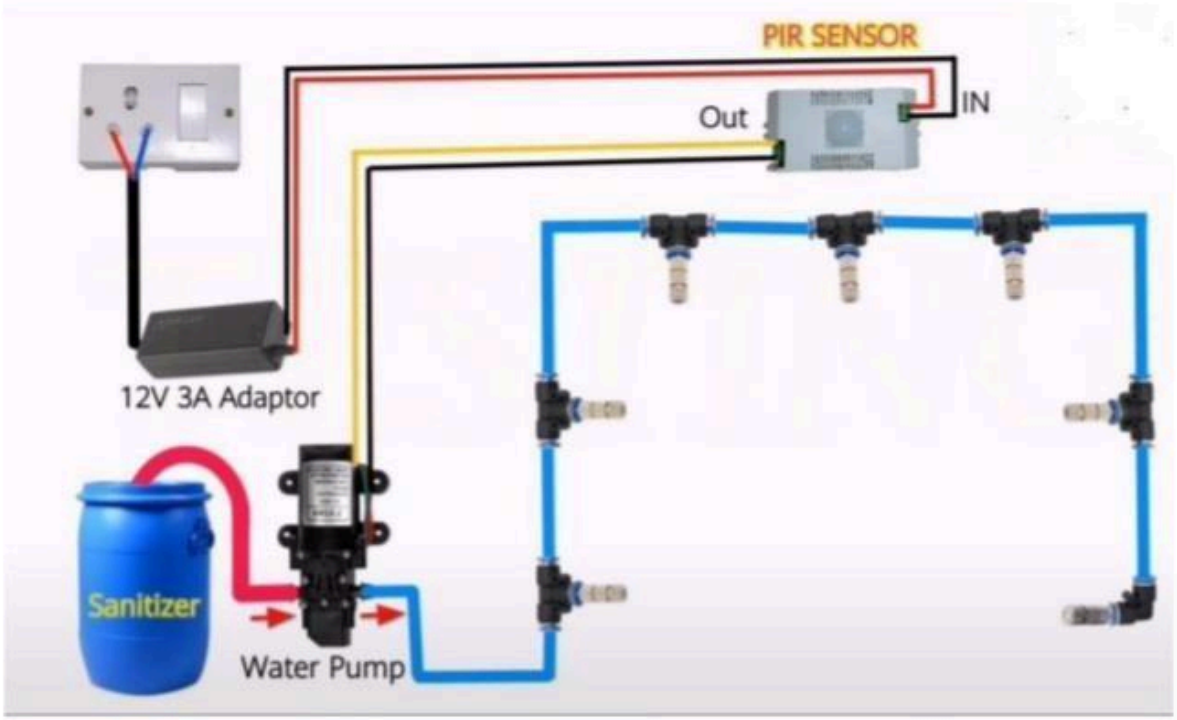
LITERATURE SURVEY

1.This mainly says about the hospital grasped infections. which is about 2 million patients per year and also says that it is 8th leading cause for deaths annually in USA. It also says that hand washing is important and also effective with proper hand washing steps, but washing with soap and water is time consuming for peak hours in hospitals. This also showed the effectiveness of the alcohol based hand sanitizers, which reduced infection rates by whopping 30%.They used hand sanitizers with 60 to 70 % ethanol or isopropanol for reducing significant number of pathogens. The patients were also given about 4.25ounce containers of hand sanitizer alongside their beds.

2.This says about the emergence of the novel coronavirus (SARS-CoV-2), which has caused unexpected challenges to health of the people of this world, this also aims at reducing the transmission rate of the diseases. this explains about the virus structure and how is it different from that of the bacterial or double stranded RNA or DNA encapsulated in ‘capsid’ and virus can replicate only in presence of a host and describes a ‘living entities’. This also gives the complete comparison between the sanitizer and the soap, foam vs gel, and it says that high concentration of ethanol can reduce the amount of virus particle present in the hand and hence proves the effectiveness of alcohol based hand sanitizer.

CHAPTER 3

3.1 Block Diagram



3.1.1 PIR Motion Sensor:

Passive infrared (PIR)sensor uses a pair of pyroelectric sensor to detect heat energy in the surrounding environment and allow you to sense motion. These two sensors sit beside each other, and when the signal differential between the two sensors changes, the sensor will engage. It will detect whether a human has moved in or out of the sensor range.

PIRs are basically made of a pyroelectric sensor which can detect levels of infrared radiation. The sensor in the motion detector is actually split in two halves. The reason for that is that we are looking to detect motion not average IR levels. The two halves are wired up so that they can cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

Fig.1

. Input DC 4.5v – 20v

. Sensing Range up to 7 meters

· Weight of sensor: 5.87gm.

Different types of motion sensors:

- Active Detectors

The active detector sensors emit the radio waves/ microwaves across a room or other place, which strike on nearby objects and reflect it back to the sensor detector.

- Passive Detectors

Passive motion sensors are opposite to active motion sensors, they do not send out anything, but it simply detects the infrared energy. Infrared energy levels are sensed by passive detectors. Passive sensors can scan the room or area, it is installed for infrared heat that is radiated from living beings.

- Combined (Hybrid) Sensors

A Combined or hybrid technology motion sensor is a combination of both active and passive sensors. It activates light or alarm only in such a case when motion is detected by both active and passive sensors. Combined sensors are useful for alarm system to reduce the possibility of false alarm triggers.

- Passive Infrared Detectors (PIR)

These are some of the widely used sensors now a days and we can be found in many home security systems. Passive infrared detectors are looking at the changes in infrared energy level that are caused by the movement of objects (humans, pets,….. etc).

- Active Infrared Detectors

It is designed to emit an electrical signal that connects to a light detector. As soon as the beam gets interrupted, it may sound the motion sensor alarm.

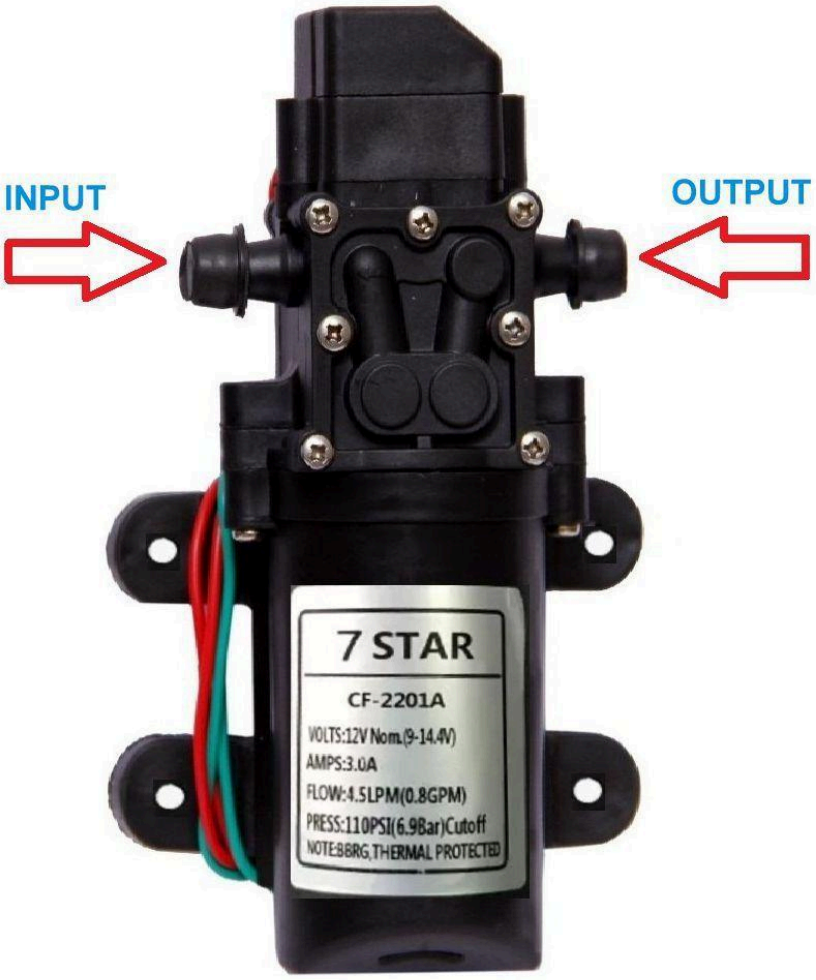
- Ultrasonic Detector

These type of motion sensors are available both in active and passive. An Ultrasonic detector sends out high-frequency sound waves that are reflected back to the sensor. If any interruption occurs in the sound waves, the active ultrasonic sensor may sound the alarm.

3.1.2 Water pump:

A Water pump is a essential tool to pump the water out from the container. Water Pump is an ideal non submersible pump for variety of liquid movement application. It has enough pressure to be used with nozzle to make spray system. The pump can handle heated liquids up to a temperature of 80°C and when suitably powered can suck water through the tube from up to 2m and pump water vertically for up to 3m.

A pump operates by using a mechanism like rotary or reciprocating and they consume energy for performing mechanical work to move the liquid. Pumps use several energy sources for their operations like manual wind power, electricity, engines etc. These are available in many shapes based on its application like medical to large industries.



Reciprocating pump

A reciprocating pump is a class of positive-displacement pumps that includes the piston pump, plunger pump, and diaphragm pump. Well maintained, reciprocating pumps can last for decades. Unmaintained, however, they can succumb to wear and tear. It is often used where a relatively small quantity of liquid is to be handled and where delivery pressure is quite large. In reciprocating pumps, the chamber that traps the liquid is a stationary cylinder that contains a piston or plunger.

Types

By source of work

- Simple hand-operated reciprocating pump. The simplest example is the bicycle pump, which is used ubiquitously to inflate bicycle tires and various types of sporting balls. The name "bicycle pump" is not really the most correct term because it generates more compression than volume displacement.
- Power-operated deep well reciprocating pump

By mechanism

- Single-acting reciprocating pump consists of a piston of which only one side engages the fluid being displaced .The simplest example would be a syringe.
- Double-acting reciprocating pump engage with both sides of the piston, each stroke of the piston carries out both suction and expulsion at the same time. Thus it require two inflow pipes and two outflow pipes.
- Triple-acting reciprocating pump

By Numbers of Cylinders

- Single cylinder - consists of a single cylinder connected to a shaft.
- Double cylinder - consists of two cylinders connected to a shaft.
- Triple cylinder - consists of three cylinders connected to a shaft.

Main components of reciprocating pump

Reciprocating pump has wide application and to clear the basic idea it is necessary to know the basic parts.

The basic parts along with its function;

- Water reservoir - it is not a part of reciprocating pump, however, it is the main source where from the reciprocating pump takes the water. It may be a source of other fluid as well.
- Strainer - It removes all impurities from the liquid to avert chocking the pump.
- Suction Pipe - It is a pipe by which pump takes the water from the reservoir.
- Suction Valve - It is a non-return type valve installed on the suction pipe and helps to flow from reservoir to pump not the vice versa.
- Cylinder or liquid cylinder - The main component where pressure is increased. It is a hollow cylinder with coatings. It consists of a piston along with piston rings.
- Piston or plunger and Piston rod - Piston is directly connected to a rod that is the piston rod. This piston rod is again connected to the connecting rod. Piston makes the reciprocating motion in forward and backward motion and creates pressure inside the cylinder.
- Piston rings - Piston rings are small but one of the vital parts to protect the piston surface as well as cylinder inner surface from wear and tear. It helps to operate the pump smoothly.

- Packing - Packing is necessary for all pumps, to have a proper sealing between cylinder and piston. It helps to stop leakage.
- Crank and Connecting rod - Crank is connected to the power source and connecting rod makes connection between crank and piston rod. These component helps to change the circular motion into linear motion.
- Delivery valve (non-return valve) - Like suction valve delivery valve is also non return type and it helps to built up the pressure. It protect the pump from back flow.
- Delivery pipe - It helps to supply the fluid at destination.
- Air Vessel - Few reciprocating pumps may have an air vessel, it helps to reduce the frictional head or acceleration head.

Reciprocating Pump Application

- Vessel, pipe, tank, tube, condensate pipe, heat exchanger etc. cleaning,
- Oil drilling, refineries, production, disposal, injections.
- Pneumatic pressure applications.
- Vehicle cleaning.
- Sewer line cleaning.
- Wet sandblasting
- Boiler feeding
- High-pressure pumps for the RO system (Reverse osmosis)
- Hydro testing of tanks, vessels, etc.
- Firefighting system.
- Wastewater treatment system.

3.1.3 Relay:

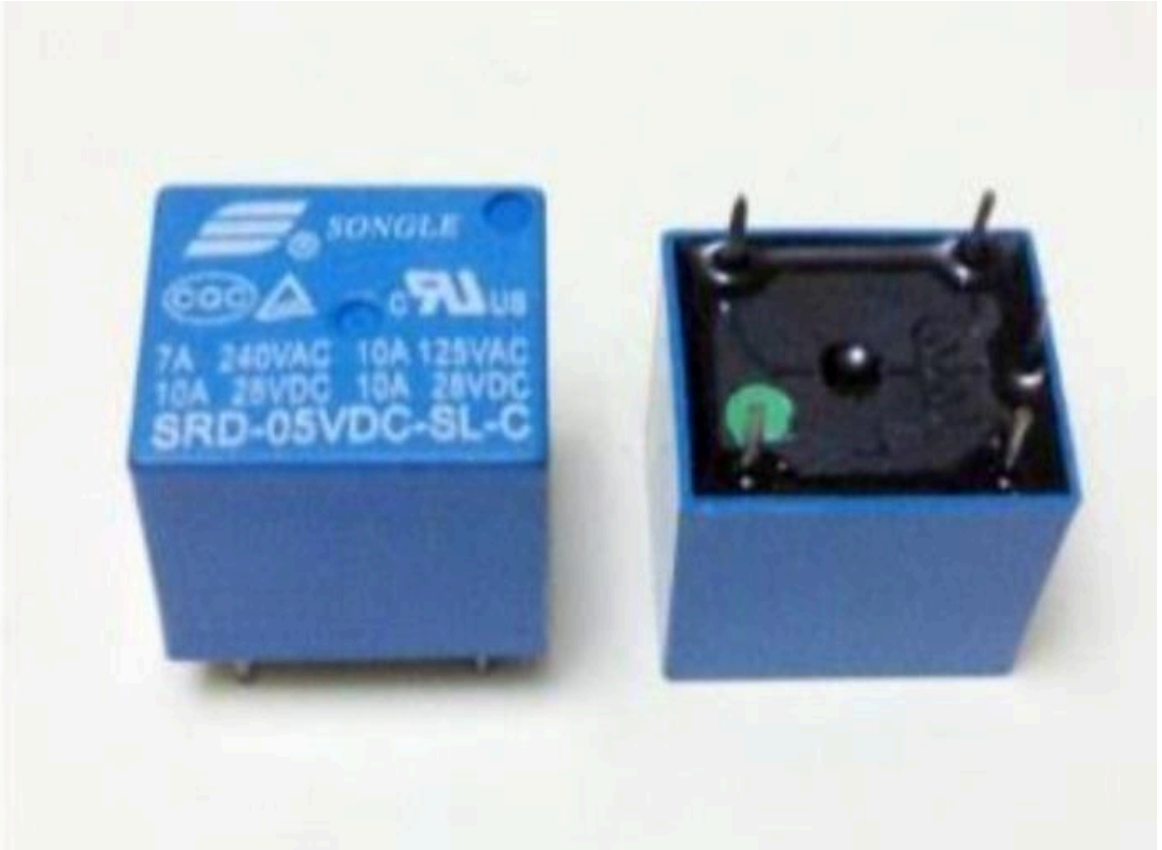
The relay is the device that opens or closes the contacts to cause the operation of the other electronic control. It detects the intolerable or undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area. Thus, protects the system from damage.

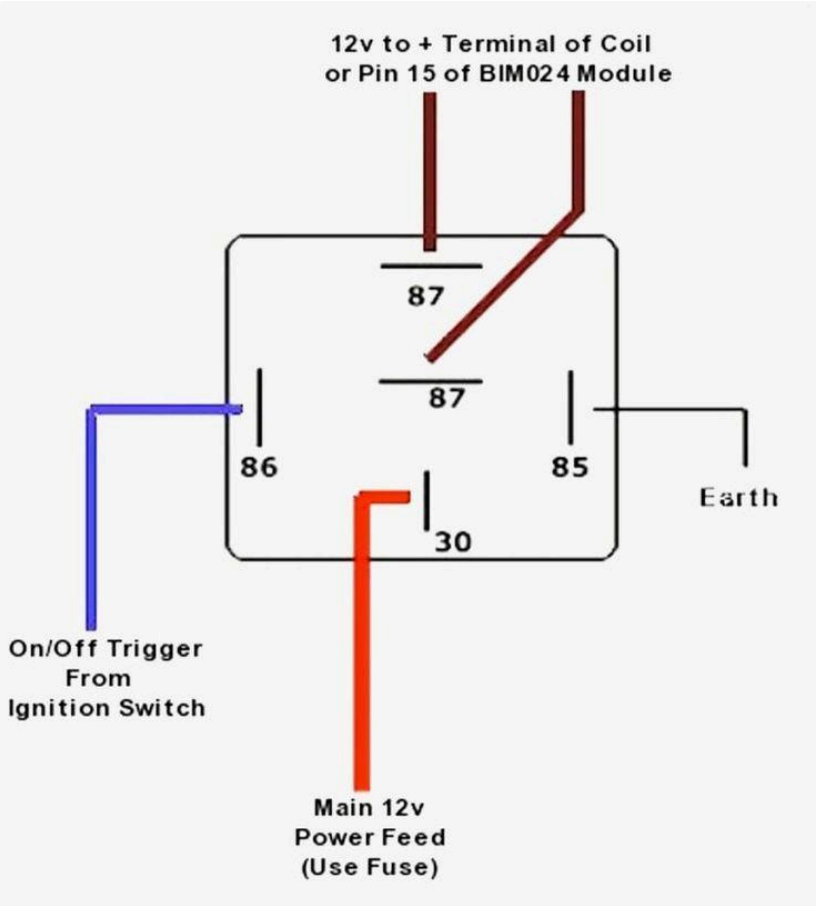
Relay works on the principle of electromagnetic induction. When the electromagnet is applied with some current it induces a magnetic field around it.

Every electromechanical relay consists of

- Electromagnet
- Mechanically movable contact
- Switching contact
- Spring

Electromagnet is constructed by wounding a copper coil on a metal core. The two ends of the coil are connected to two pins of the relay. These two are used as DC supply pins.



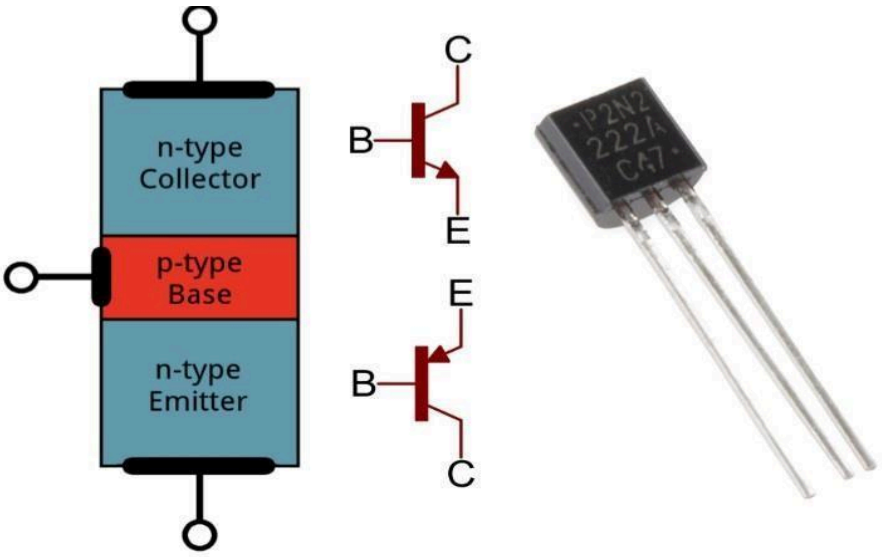


Circuit diagram of 12V Relay

3.1.4 Transistor:

A Transistor is a semiconductor device used to amplify or switch electric signals and electrical power. Transistors are one of the basic building blocks of modern electronics. It is composed of semiconductor material usually with three terminals for connection to an external circuit.

Transistor, semiconductor device for amplifying, controlling and generating electrical signals. Transistors are the active components of integrated circuits, or “microchips” , which often contain billions of these minuscule devices etched into their shiny surface.



Types of Transistors

There are a varieties and different types of transistors available in today's market including Bipolar, Darlington, IGBT, and MOSFET Transistors.

- Bipolar Transistor - A Bipolar Junction Transistor (BJT) is a three-terminal electronic device made of doped semiconductor material and may be used in amplifying or switching applications. Bipolar transistors are so named because their operation involves both electrons and holes. A bipolar transistor will have terminals that are labeled: emitter, collector, base. A small current at the base terminal (passing from the base to the emitter) can modify or switch a much larger current between the collector and emitter terminals.

- Darlington Transistor - The Darlington Transistor is actually two bipolar transistors, connected in such a way that the current amplified by the first transistor is amplified even further by the second one. This model offers a higher common-emitter current gain than if both types of transistors are separated and can even take up less space because both transistors can share a collector.
- IGBT Transistor - An Insulated Gate Bipolar Transistor (IGBT) is a three-terminal power semiconductor device typically used as an electronic switch. IGBT's are types of transistors that are

capable of switching electric power in many modern appliances such as electric cars, trains, variable speed refrigerators, air-conditioners and even stereo systems with switching amplifiers.

- MOSFET Transistor - A Metal-Oxide-Semiconductor Field-Effect Transistor (MOFET) is used in integrated circuits to control the conductivity of a channel. MOSFETs are highly dependent on negative and positive charges. They have many purposes, including limiting a device's power levels, storing data, and being used as a switch for a wide variety of electronic devices.

Transistor Construction

Many types of transistors are made of a solid piece of a semiconductor material, with at least three terminals for connection to an external circuit.
The most basic element of a transistor power module is the silicon chip. Because of the high gain of Darlington configurations, most bipolar types of transistors and transistor modules contain Darlington transistor chips. Some of these chips are planar structures, as illustrated in Figure 1.1. The surface of a planar chip can be easily treated, simplifying mass production. Various manufacturers employ state-of-the-art fine line emitter patterns, resulting in excellent gain and safe operating area performance. High blocking voltages are achieved by using a triple diffusion process and guard rings.

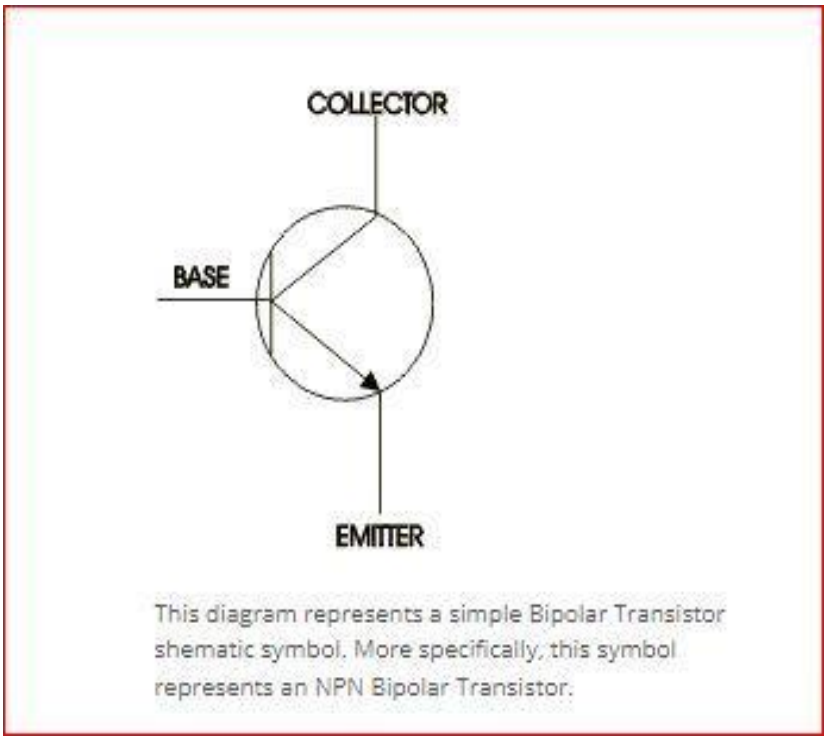
Figure 1.2 illustrates the internal construction of a transistor module. The transistor chip is soldered to a molybdenum base. The molybdenum base alleviates thermal stress on the chip due to the nearly equivalent thermal expansion coefficients of silicon and molybdenum. This assembly is next soldered to a copper collector electrode along with a freewheeling diode chip. The copper electrode is in turn soldered to a ceramic substrate. The ceramic substrate can withstand 2000 to 2500 volts without adding significantly to the device's thermal resistance. The chips are bonded with aluminum wire and then encapsulated with silicone gel to guard the chip surfaces. Finally, the package is back-filled with epoxy resin to increase mechanical and environmental strength.

Transistor Applications

The proper application of power semiconductors requires an understanding of their maximum ratings and electrical characteristics, information that is presented within the device data sheet. Good design practice employs data sheet limits and not information obtained from small sample lots.

A rating is a maximum or minimum value that sets a limit on device capability. Operation in excess of a rating can result in irreversible degradation or device failure. Maximum ratings represent extreme capabilities of a device. They are not to be used as design conditions.

A characteristic is a measure of device performance under specified operating conditions expressed by minimum, typical, and/or maximum values, or shown graphically.



This diagram represents a simple Bipolar Transistor shematic symbol. More specifically, this symbol represents an NPN Bipolar Transistor.

3.1.5 Diode:

A diode is a semiconductor device that essentially acts as a one-way switch for current. It allows current to flow easily in one direction, but restricts current from flowing in the opposite direction.

Diodes is also known as rectifiers because they change alternating current into pulsating direct current. Diodes are rated according to their type, voltage, and current capacity.
Diodes have polarity, determined by an Anode (positive lead) and cathode(negative lead). Most diodes allow current to flow only when positive voltage is applied to the anode. A variety of diode configurations are displayed below

In our project we have used 1N4007 diode because it is a rectifier diode, designed specifically for circuits that need to convert alternating current into direct current. It can pass currents of upto 1A , and have peak inverse voltage rating of 1000V.

1N4007 Characteristics:

- Maximum recurrent peak Reverse voltage 1000V
- Maximum RMS voltage 700v
- Maximum DC blocking voltage 1000V
- Average forward current 1A
- Peak forward surge current 30A
- Maximum instantaneous forward voltage 1V
- Mounting type: through Hole
- Operating temperature: 55 degree C – 150 degree C

Applications of diode:

- Turning AC into DC voltages
- Drawing signals from a supply
- Controlling the size of a signal

3.1.6 Capacitor:

Capacitor is a device that stores electrical energy in an electric field. It is passive electronic component with two terminals. While some capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit.

Capacitors have many important applications. They are used, for example, in digital circuits so that information stored in large computer memories is not lost during a momentary electrical power failure. Capacitor plays an even more important role as filters to divert spurious electric signals and there by prevent damage to sensitive components and circuits caused by electric surges.

The physical form and construction of practical capacitors vary widely and many types of capacitors are in common use. Most capacitors contains at least two electrical conductors often in the form of metallic plates or surfaces separated by a dielectric medium. A conductor may be a foil, thin film, sintered beam of metal, or an electrolyte. The nonconducting dielectric acts

to increase the capacitor's charge capacity. Materials commonly used as dielectrics include glass, ceramic, plastic film, paper, mica, air, and oxide layers. Capacitors are widely used as

part of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy.

Capacitors are widely used in electrical circuits to store small amounts of energy, but have never been used for large-scale energy storage. Capacitor is a little like a battery. Although they work in completely different ways, capacitors and batteries both stores electrical energy.

Applications of capacitor:

- The capacitor is used for storage of energy
- It is used in filter circuits to minimize the ripple voltage
- Capacitors are used to run the motor
- Bypass the high frequency signals
- Used in tank circuits in electronic oscillator
- Used in snubber circuit to suppress radio frequency interface
- It is used in timing circuit to select the time
- It is used in single phase motors
- Capacitors are widely used in radio and telecommunications
- It is generally used in filter circuits and tuning circuits
- It is used in long time constant circuits and also used as storage capacitor in digital equipment
- Used in tuning circuits for selection of frequency used as temperature constant
- Used in high frequency microwave system

A charged capacitor stores energy in the electrical field between its plates. As the capacitor is being charged, the electrical field builds up. When a charged capacitor is disconnected from a battery, its energy remains in the field in the space between its plates

3.1.7 Resistors:

A Resistor is electronic two terminal electronic component that produces a voltage across its terminals that is proportional to the electric current passing through it in accordance with ohm's law

$$V=IR$$

Resistors are elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of high-resistivity alloy, such as nickel/chrome).

The primary characteristics of a resistor are the resistance, the tolerance, maximum working voltage and the power rating. Other Characteristics include temperature coefficient, noise and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance is determined by the design, materials and dimensions of the resistor. Resistors are made to control the flow of current, to work as voltage dividers, to dissipate power and it can shape electrical waves when used in combination of other components. Basic unit of ohms.

Theory of operation:

Ohm's law: V=IR

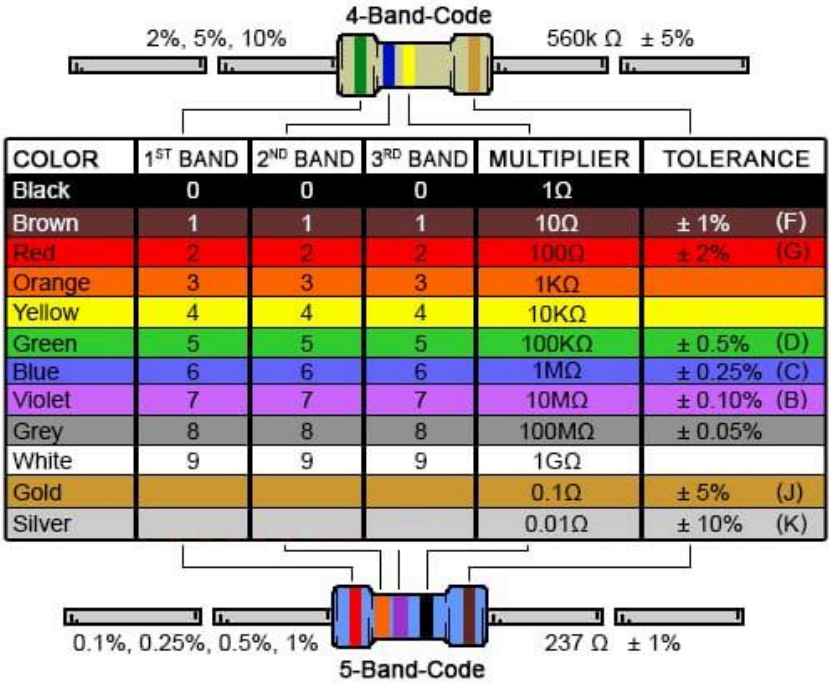
The behavior of an ideal resistors is dictated by the voltage(V) across a resistor is proportional to the current(I) through it where the constant of proportionality is the resistance(R).

Power dissipation:

The power dissipated by a resistor (or the equivalent resistance of a resistance of a resistor network) is calculated using the following

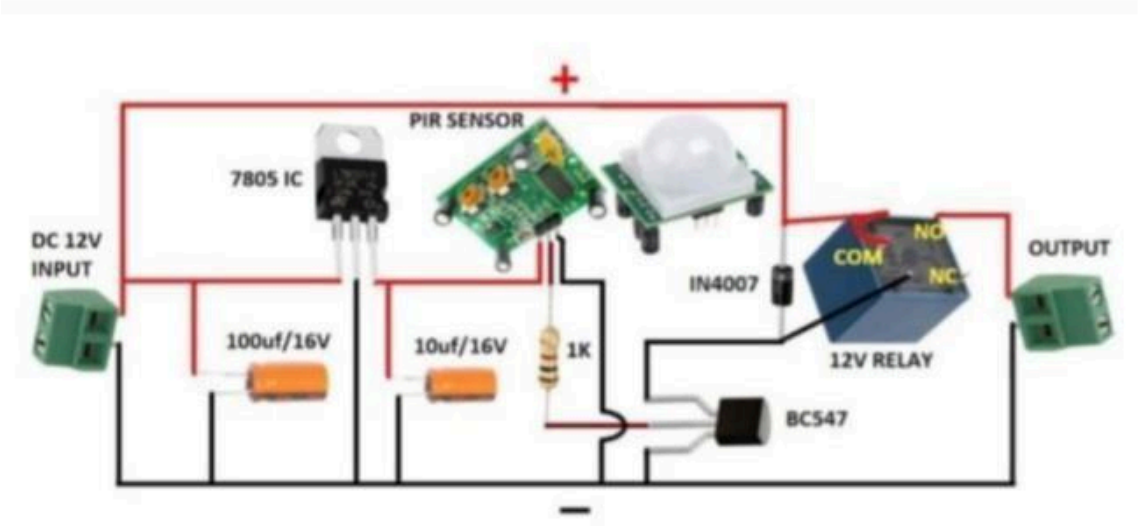
Resistor

Colour bands in resistor

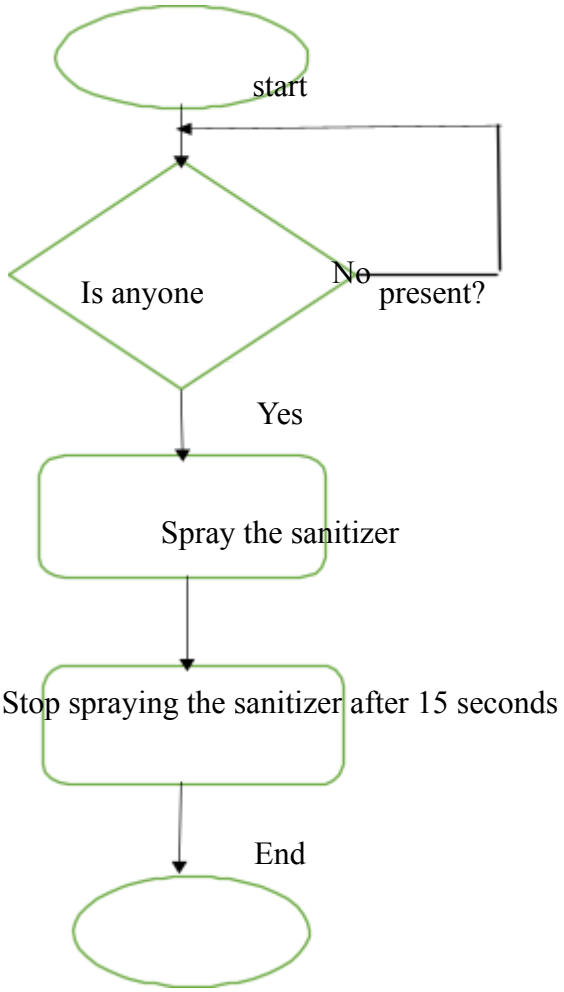


COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	± 0.5% (D)
Blue	6	6	6	1MΩ	± 0.25% (C)
Violet	7	7	7	10MΩ	± 0.10% (B)
Grey	8	8	8	100MΩ	± 0.05%
White	9	9	9	1GΩ	
Gold				0.1Ω	± 5% (J)
Silver				0.01Ω	± 10% (K)

3.2 Circuit Image



3.3 Flow Chart:



3.4 Application:

- Used in hospitals
- Used in colleges
- Used in public places
- Used in Railway stations
- Used in airports

3.5 Advantages:

. Provides a truly touchless sanitization

. Easy to use

. Delivers a standard amount of sanitizer

. Acts quickly to kill microorganisms

. Requires less time

.

CHAPTER 4

Operating Procedure:

This project is aimed to spray sanitizer automatically when it detects a person. Detection circuit is used to detect whether a human is present or not. If human is present, it must spray sanitizer from various nozzles connected to the liquid sprayer pump. It stops spraying after 15 second from its start time. PIR sensor is used to sense the human. The sensor will be installed at the entrance of the disinfection chamber.

A relay is connected to the pump. Electronic circuit is going to control automatically the liquid spray pump through the relay.

CHAPTER 5

Conclusion:

It is our pleasure that we contribute to our country by working on this project. This project will significantly help in preventing the further spread of the dangerous virus. The alcohol based body sanitizer are more effective than soap and also easy to use. It is also a contactless dispensing sanitizer. It can be manufactured in any household at a very low cost and can be installed it in offices, education institutions, public transport, regular shops etc.

Future scope:

As expressed before contactless sanitization is commonly programmed non-contact and waterless hand sanitizer which made by Electrical and Electronic based parts, as opposed to mainstream thinking. It is needed for everyone so everyone can buy this gadget. It is very much required especially in Industries, schools, colleges, shops, hospitals, public vehicles. By using solar panels, operation can be done. In coming days everyone can afford it easily.

CHAPTER 6

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