

UVC Based Sanitizing Chamber

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Abstract

In this pandemic situation of COVID-19, sanitizing is one of the most important and crucial activity which needs to be done timely. As per the report issued by medical experts COVID-19 can leave on the surfaces that the patient or a person suffering from Covid-19 may touch timely. The molecules of virus can land on surfaces or devices of daily use and thus infecting it and making it more prone to be infectious. The contagious mode of the virus makes it more deadly and results in extreme precautions to be taken in order to prevent an individual from getting infected by the virus. In order to overcome this problem sanitizing chamber can be used to sterilize the equipment and make them ready to use again for the users. In a country with less developed medical facilities and services sterilization proves to be a useful step. The medical equipment like masks, mobiles, wallet, small clothes, etc. can also cause viruses. Our project provides support to healthcare organization's looking for alternative methods to preserve and reuse such equipment.

In the context of COVID-19, everyone has to protect themselves and for that, everyone is doing what they need to do to protect themselves, but we are making this project to sanitize the things that can be infected due to certain things. People are using sanitizer to protect themselves from getting infected but if they can't use sanitizer on some things then they can be bad because there are different types of sanitizers available in the market but they are in liquid form and you can use liquid sanitizer on your mobile, electronics, and money. Can't use and to avoid the risk that a person can be infected from this thing, we have started this project in which you can sanitize your mobile, electronics, money, etc., and its use will not spoil those things, because it is not in liquid form, but in light form. Destroys germs.

Keywords: UVC; COVID-19

Features

- 1) Completely touch-free.
- 2) 360 degree sterilization.
- 3) UVC base Interactive Display.
- 4) Adjustable timer up to 30min.
- 5) Instructions Buzzer and indication Lights.
- 6) Disinfection in minimum time.
- 7) Sterilize more than 1 item at a time.

Introduction

In the context of COVID-19, everyone has to protect themselves and for that, everyone is doing what they need to do to protect themselves, but we are making this project to sanitize the things that can be infected due to certain things. People are using sanitizer

to protect themselves from getting infected but if they can't use sanitizer on some things then they can be bad because there are different types of sanitizers available in the market but they are in liquid form and you can use liquid sanitizer on your mobile, electronics, and money. Can't use and to avoid the risk that a person can be infected from this thing, we have started this project in which you can sanitize your mobile, electronics, money, etc., and its use will not spoil those things, because it is not in liquid form, but in light form. Destroys germs [1].

In today's modernized world, health and wellness of a person is of extreme importance. Maintenance of proper health and hygiene of the individual's has become a key factor for any organization. Surgical mask, mobiles money and many such items of daily use if not sanitized properly may result in widespread of diseases from one person to another.

As the incidence of Covid-19 are increasing exponentially in India and worldwide, healthcare provider demand for such necessities is currently outpacing supply. At such point, sentences to safely expand the life span of medical equipment's is critically important. In the recent days, week, months, in midst of current pandemic, there has been a concerted effort to identify viable ways to conserve such equipment. Among all the methods developed so far sterilization process involving use of UV light has been one of the most effective ways to outcast the virus. Ultraviolet light is a form of electromagnetic radiation of a light with more energy than visible light, but less energy than x-rays. It can be classified into UV-A (315-400nm), UV-B (280-315nm) and UV-C (100-280nm). The higher energy UV rays can damage DNA and RNA via cross linking of thymidine and Uracil nucleotides, respectively. The damage caused to DNA and RNA can result in destroying of replication of this organisms as it removes them from core [2, 3].

System Modeling

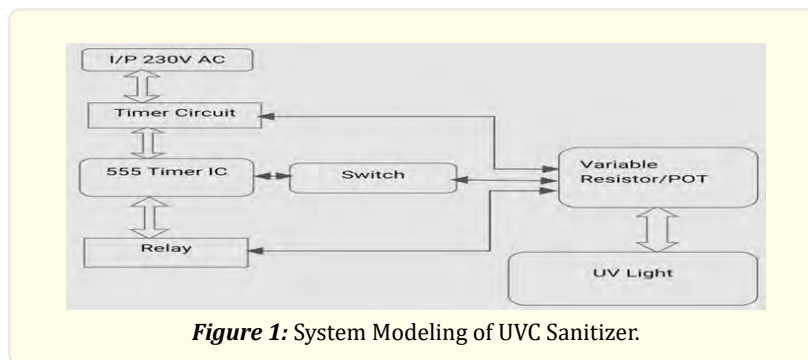


Figure 1: System Modeling of UVC Sanitizer.

The UV-C based sanitizing chamber working is shown in the block diagram present above. The chamber receives an input of 230 volt AC supply which activates the circuit present inside it. After getting the input supply, the timer circuit present inside receive this supply and gets activated. As a result of it, IC 555 timer circuit compare the voltage based on the Op-amp present inside it. The circuit activate slide and stay on for a set time. To activate the light again you must press the momentary contact button [4].

The time in which the light remains on depends on the value of resistor and capacitor C1.

To increase this time you can change the value of the R2 register to larger one. Are to can also be replaced by potentiometer to avoid the need of change the register with another to different value. When the sw1 switch is pressed the electrolyte capacitor is charged through resistors R5. The capacitor will have the same voltage of the power supply and the transistor Q1 gets into its saturation region. This in turn saturates transistor q2.

Thus we get the collector of q2 with the voltage slightly lower than the source voltage and the bulb light ON. The circuit can operate with a 9 volt battery or 12 volt DC voltage source.

Objective

The main objective of this project is to sanitize the items you use in your daily life which you cannot sanitize with liquid sanitizer so there is a possibility of spoilage of those items which cannot be sanitized. The main objective of this project is to sanitize items such as mobiles, files, documents, money, etc., which can be damaged by liquid sanitizer.

Scope of Project

In human daily life, a person comes in contact with many Germs and there can be Germs on every object. But this project is made because some things cannot be sanitized.

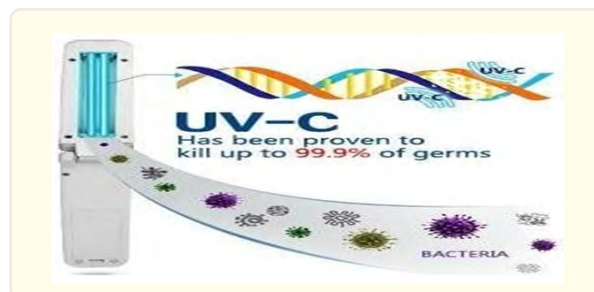
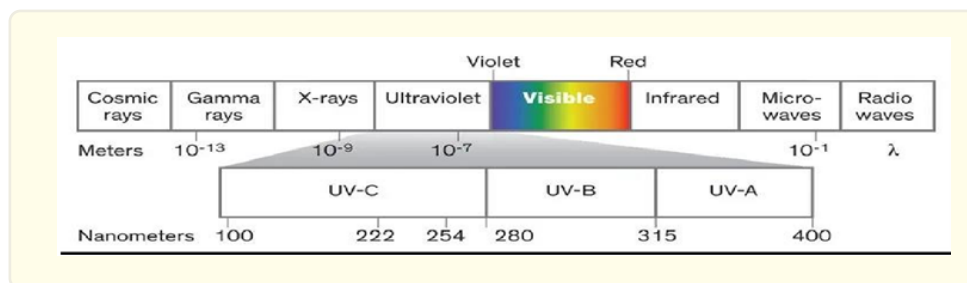
We can use this project as medical equipment.

We can also use this project in other places like hospitals, colleges, offices and even at home. Its use will save human beings from getting infected with germs as we can use this project to eradicate the germs. This project will be very useful in the future as we can also disinfect the vegetables in the market. This will benefit every human being.

The project targets public places such as airports, railway stations, Hospitals, Schools, Colleges, Corporates and malls where average footfall is greater to maintain the social distancing norms. Physical implementation of this project at least one of the above places will ensure complete destruction of COVID-19 virus.

Literature Survey

The rising amount of imminent and ongoing biological threats increases risks at public places. Disinfection is the major chain breaker in the COVID-19 pandemic with UVC source and appropriate intensity. At the same time human safety is a major concern while dealing with actual intense UVC light. We develop a disinfection machine which will be operated automatically and with a contact less system. Intense UV-C radiations will disinfect all the human belongings inside the close chamber of the machine. The project targets public places such as airports, railway stations, Hospitals, Schools, Colleges, Corporates and malls where average footfall is greater to maintain the social distancing norms. Physical implementation of this project at least one of the above places will ensure complete destruction of COVID-19 virus. Time of the disinfection can be varied automatically using IOT and depending on the real time active cases in the locality. Weight sensors, bag detection, battery back up and automation are few added advantages.



Deep Ultraviolet LEDs have found applications in medicine, air, water and surface sterilization and decontamination, biotechnology, bio-agent detection and identification, radiation hard UV sources, UV curing, and biomedical instrumentation [5-11].

Hardware Tools

Adjustable timer circuit

In this circuit a timer with cyclic on off operations is designed. This circuit uses very basic components like 555 timer.

These on off intervals can be adjusted by varying the 555 timer output and number of counter outputs.

Working

- When the power supply is given, 555 timer produces square wave at pin 3 as it is in a stable.
- This square wave is given decade counter which has 10 outputs activated sequentially upon a given clock input.
- The outputs of the decade counter drive the transistor into active mode so that relay coil will be energized. (Instead of 6v relay one can use 12v relay also but relay should be applied with 12v instead of 6v.)
- Here the length of ON-time of the load is a multiple of 555 timer period output and number of outputs used in CD4017.
- Suppose in this circuit 3 outputs are used. So, time of load is 3 times of T (high) and off time is 9 times of T (high).
- Therefore, ON and OFF can be varied for desired duty cycles by appropriately connecting the pins of decade counter.
- It is also possible to add a sensor or switch at reset input of decade counter for automatic turning off the load in emergency or needy (for an automatic operation) situations.

Components

- R1 and R2 – 47 K Ω
- R3 – 15K Ω
- VR1 – 1M Ω
- C1 100 μ F
- C2 0.01 μ F
- C3 0.1 μ F
- Diodes
- 555 Timer IC
- BC 148 B Transistor
- 12V Relay

UV Light

UV or ultraviolet light is a type of radiation. In simple terms, when bacteria or another type of microbe is directly exposed to certain types of UV light, the DNA (its fundamental building block) of the cell is damaged, preventing it from replicating. If a cell cannot reproduce, then the cell cannot cause infection, which is how UV light kills bacteria.

The UV process is a physical process as opposed to the addition of chlorine to the water to address microbiological issues which is a chemical process. This is important, because it allows UV to kill bacteria and other microorganisms without adding anything to the water or creating what is known as disinfection by-products (like trihalomethanes, called THMs for short, which are proven to be carcinogenic).

Advantages

- To sanitize items on which liquid sanitizer cannot be used.

- This will not damage electronic items or important documents.
- To sterilize more than 1 item at a time.
- Instructions after disinfection
- Adjustable time up to 30min for early disinfection
- Automatic emergency stop cycle Hardware designed with absolute safety in mind.
- This is non chemical treatment no harmful chemicals need to be added.
- Effective - 99.99% of microorganisms it is an ecological technology.

Limitations

- UV light can damage human skin and eyes.
- Excessive exposure to UV light.
- Difficulty moving from one place to another.
- It will take at least 1 min more time to disinfect. If done in a short time, germs are less likely to die.

Applications

- Useful in office.
- Useful in hospital.
- Useful in daily life in home.
- Useful in schools and colleges
- Useful in Mall.

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