



Design and Fabrication of Cash Sanitizing Machine

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Abstract : Cash is being most essential asset of our daily life, it is most often passed from one person to another which makes it a big asset of spreading germs and bacteria which may harm our health. Due to current Pandemic situation it is riskier to exchange cash. Digital Banking or UPI is a big relief for controlling the spread of bacteria and germs. The ordinary sellers and public transports such bus, railways don't accept digital payment which might spread bacteria on large scale. Because the currency note might act as the carrier of these dreadful diseases which needs engineering solution to avoid this problem. UV-beams use for disinfect purpose, have destructive impacts. So, a new model is to prevent the problem of spreading of corona virus by hand to hand money transfer. This paper is about preventing the spreading of corona-virus through currency by developing automatic, portable liquor-based cash disinfectant. The model disinfects cash by ethyl alcohol.

Keywords – Cash, Bacteria, Sanitize, Disinfect, COVID-19.

I. INTRODUCTION

From hundreds of years we sought ways to prevent the spread of infectious disease. Since the turn of the 20th Century, more complex disinfectant technologies have been engineered, many of which are still used today. These chemistries we have trusted for decades to disinfect are considered 'legacy' disinfectants; however, though some of these have been proven to be effective at killing pathogens, they often carry a toll on users, surfaces, and the environment.

For this disinfection purpose we use methods like sanitization, disinfection, sterilization. Sanitization is the process of eliminating germs from the surface. Sanitizing agents come in various forms liquids, sprays, powders or granules. Disinfection is a method of destroying pathogenic microorganisms and removing most organisms present on the surface, so that they cannot pass on infections. Sterilization involves handling and killing all microbial and forms of bacteria, fungi, and viruses present on an object's surface.

II. LITERATURE REVIEW

1. Z. Buntat et al. (2019) proposed an Ozone-Based Surgical Equipment Sterilizer for the welfare of doctors. The specialty of the device is that it operates at low temperature and can be used to sterilize both heat sensitive and non-heat sensitive equipment [3].
2. S. Kwak et al. (2013) proposed a smart device interface for controlling UV Sterilizer. This helped in sewage water treatments [4].
3. U. Schnabel et al. (2012) implemented formaldehyde sterilizer for Medical devices and used plasma technologies [5].
4. M. Von Recklinghausen (1914) proposed sterilizing method of water by employing mercury vapor quartz lamp. The paper alludes to the chronicled advancement of mercury light water sterilizers and the improvement of gun lights for enormous sanitizing units. Various germs are of various affectability to ultra-violet light [6].
5. J. George and J. Barrett (2015) proposed Steam Sterilization approach for Dynamic Moisture Diffusion in Packaging Materials to remove germs [7].

6. K. Matsumoto and M. Kanitani (2003) proposed ethylene-oxide plasma sterilization system without toxic residuals. The entire sanitization time is 1/20 or less, including the post-handling time to decay poisonous residuals [8].
7. E. Leiss-Holzinger et al. (2017) proposed a Sterilization Process by Direct Steam Monitoring method. Steam sterilization is a standard instrument in the field of medicinal services and clinical hardware as it is prudent, viable, and dependable [9].
8. T. Kuwahara (2018) proposed on-thermal plasma-based Water Sterilization by Bubbling Ozone method. This work proposes a vitality effective NTP sterilization framework. The framework depends on electrolysis of water to deliver O₂ and hydrogen H₂. The O₂ created is utilized to produce O₃ for sterilization [10,11].

III. METHODOLOGY

2.1 Project Background

In December, 2019, Wuhan, Hubei province, China, became the center of an outbreak of pneumonia of unknown cause, which raised intense attention not only within China but internationally. On February 2020 WHO names the disease caused by the coronavirus “covid-19” or “coronavirus disease 2019”, after the year the first cases were reported. Soon the condition becomes more worst and the no of patients increases day by day. On September 2020 world reaches a tragic milestone of 1 million deaths caused by covid-19[1].

The virus that causes COVID-19 is spread as a bio-aerosol. Depending on the mechanism of generation breathing, talking, cough, sneezing, etc. the bio-aerosols settle out of the air column in less than two meters and in 15 minutes. While reports exist that claim exceptions to these figures, they provide a good frame of reference for creating a safe business workspace.

While the virus is quite fragile, reports suggest that it can persist on hard surfaces, both porous and non-porous, from minutes to hours, increasing the opportunity for it to transfer from hand to body and therefore increase the risk of infection. According to a study from National Institutes of Health, CDC, UCLA and Princeton University scientists in The New England Journal of Medicine. The scientists found that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was detectable in aerosols for up to three hours, up to four hours on copper, up to 24 hours on cardboard and up to two to three days on plastic and stainless steel [2]. The results provide key information about the stability of SARS-CoV-2, which causes COVID-19 disease, and suggests that people may acquire the virus through the air and after touching contaminated objects.

The banknotes are also come in contact with the viruses. As we know Currency notes play a vital role in the world starting from micro business to daily needs of people across the world. As per the statistical reports given by Reserve bank of India, 21.1 trillion currency notes are in circulation among the people in 2019 financial year which is 17% higher than the previous years. The rapid spread of the corona virus infectivity has raised concerns over surface-to-human’s transmissions, including through currency notes. This increases the panic level of spread of micro-organisms through the currency notes circulation which leads to the spread of diseases like COVID-19.

2.3 Motivation of Work

We all know that currency is one of the most efficiently used in our day to day life. There are over trillion of currency available in cash are circulating all over India. During the Pandemic this currency is playing a role of transfer agent as hand to hand transfer of cash is playing role in increasing the number of germs transferred. According to World Health Organization over 70-75 percent of ethyl alcohol is sufficient to disinfect corona-virus. Now a days most of the transaction are done through net banking and withdrawal are done through ATM most of time but there is huge amount of people who even today deals with cash mostly vegetable vendor, taxi and auto rickshaw drivers etc. The currency obtained by this people is deposited in Bank and to keep this currency away from all kind of germs we are developing a device that would disinfect the currency. It would help to disinfect currency at a great level

The ultraviolet irradiation is an option to disinfect and decontaminate surfaces and inanimate objects, like clothes, utensils, medical instruments. Tseng and Li (2007) demonstrated the susceptibility of SARS-CoV at various relative humidity. The effect of ultraviolet germicidal irradiation to inactivate surface viruses were demonstrated. Kim and Kang (2018) measured the effectiveness of UVC LED in inactivating viruses. Moore in an article in iee spectrum (dated 16th April 2020) explains how UVC LED makers claim to eliminate corona virus using a 30 s dose from a 3 cm distance. Although the UVC LEDs are useful in decontaminating influenza

viruses including the recent novel coronavirus, their effectiveness decreases with increasing relative humidity (Tseng and Li 2007; McDevitt et al. 2012) [12,13].

Ultraviolet rays can have both harmful and beneficial effects. UV-C has the property of ionization thus acting as a strong mutagen, which can cause immune-mediated disease and cancer in adverse cases. Numbers of genetic factors have been identified in human involved in inducing skin cancer from UV-radiations. Also, UVC radiation can only inactivate a virus if the virus is directly exposed to the radiation. Therefore, the inactivation of viruses on surfaces may not be effective due to blocking of the UV radiation by soil, such as dust, or other contaminants such as bodily fluids.

2.4 Components and Material

Table 2.4 Components list and Specification

Sr. No.	Part Name	Quantity	Material	Part Description
1.	Motor	6	Plastic	12V, 30 RPM
2.	Bearing	10	Steel	607-2Z - Deep groove ball bearing
3.	Spray Nozzle	2	Brass	Conical full cone spray pattern
4.	Motor Pump	1	Plastic	3-6V DC
5.	Cooling Fan	2	Plastic	5-12V DC, 40×40

Wooden blocks are used for supporting purpose and the panel is made up for of marine ply. Which is water resistant and having the low weight and cost than metal. The inner frame is design such that the components are fix in simple manner and the cash passes through it easily without harm.

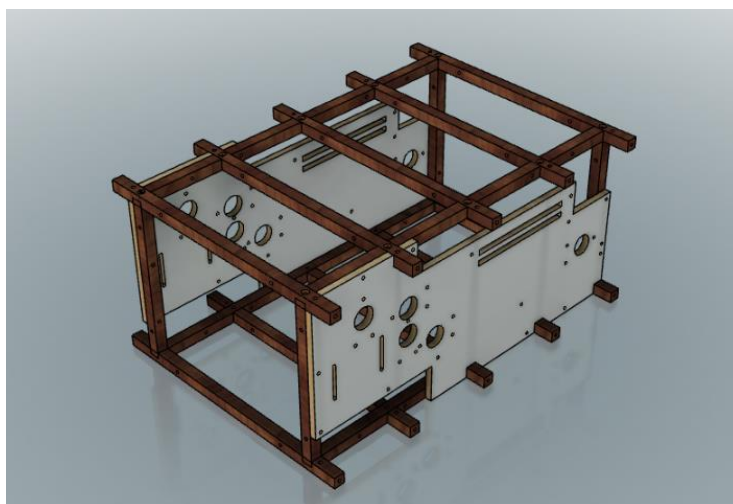


Fig.1 Inner frame

2.5 Working

The Electronic Currency Note Sterilizer Machine comprises of the following modules:

- DC Motor 1(input)
- DC Motor 2 (input)
- DC Motor 3 (roller)

- DC Motor 4 (conveyor)
- Sensor unit for currency (note) detection
- Microcontroller unit
- Motor driver unit
- Sanitizer spray generation module
- Drying unit (DC Motor 5 and 6)
- Sterilized currency collection tray

The below block diagram shown in Fig.2 shows a complete view of Proposed Electronic Currency Note Sterilizer Machine. The Operation of the proposed system is as follows:

The currency note brought near the input area of the system is sensed by the active network of sensors. The sensor sends the signal to the Microcontroller unit. The microcontroller activates the motor 1, motor 2, motor 3, motor 4 and drying unit through the motor driver circuit which sucks the currency note into the system through rollers. The roller connected to motor 3 is wound by microfiber cloth. When the Currency note entered into the system, the sanitizer spray module present both in the top and bottom of the currency note containing the sanitizer spray is activated through the controller unit. The sanitizer will spray on the microfiber from both top and bottom module. The currency note passes through this roller so that it sterilizes both sides of currency note. This action destroys the germs and micro-organisms present in the currency note eradicating the community spread of dreadful disease like COVID-19 through that particular currency note. After sterilization, Drying unit help to dry currency note and conveyor sends out the sterilized currency note into the collection tray. When no currency is detected by sensor unit it sends signal to microcontroller unit and then microcontroller stops the operation. Microcontroller act as the heart of the system controlling the entire process. The above system will avoid the community spread of COVID-19.

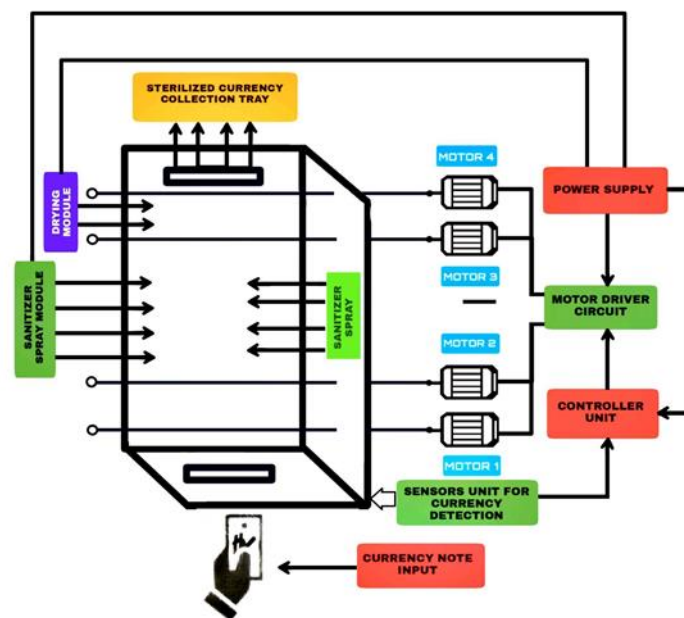


Fig.2 Circuit Block Diagram

IV. CONCLUSION

We all know that notes carry various types of harmful germs due to the infinite number of hand overring. According to the research 26,000 types of bacteria can be there in banknote. But we have not any modern and smart option to sterilize the dirty, unhygienic notes. The invention can solve the problem of spreading infection through currency notes or coins. Although the device is planned only for COVID-19 situation but in near future hopefully it can prevent currency from many antibacterial elements by adding alcohol to spoil the various types of germs. An Electronic Currency Note Sterilizer Machine that sterilizes the currency notes and reduces the spread of infectious diseases. This invention can save people from spreading of infection by different antibacterial elements forever and safe mankind. In future the process can safe mankind from different infectious disease.

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