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Automatic Sanitising Machine with UV and Proximity Sensor

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ABSTRACT: Demand for sanitizers has surged since the corona-virus broke out and spread around the world. Hand sanitizers are usually applied by squirting the sanitizer liquid when one presses a pump with one's hand. This causes many people to come into contact with the pump handle. Also, if the fomites are the things such as bags, luggage... Etc. Which are carried by the person. Which increases the risk of viral transmission. Therefore, this paper suggests the design of an automatic hand sanitizer system with uv and proximity sensor which is automatic and non-contact.

I. INTRODUCTION

Sanitizing means cleaning or sterilizing an object or body. Sanitization can be done in many ways UV sanitization, soap sanitization, bleach sanitization.... etc. Demand for sanitizers has surged as the corona-virus broke out and spread around the world. Alcohol gel hand sanitizers are usually applied by squirting the sanitizer liquid when one presses a pump with one's hand. This causes many people to come into contact with the pump handle, which increases the risk of viral transmission. Pressing the pump handle is bothersome, and many pass by without disinfecting their hands. Moreover, each person presses the pump handle differently, making it difficult to predict the amount of use and to manager fills and replacements. For this reason, the actual use of hand sanitizers is reduced, which does not help prevent spread of the virus. In this paper, the design of an automatic hand sanitizer system for hand sanitizing and an UV sanitization for the fomite object sanitization is presented. The UV sanitizer uses the power of UV rays to kill the viruses. We just need to place the object on the conveyor belt. Through the belt the object, that need to be sanitized, will move to the machine that will sanitize the object with UV light and we can take the sanitized things after sanitizing hands with the IR controlled hand sanitizer already proposed with the same module. the ir detect the presence of hand and automatically spay the liquid, which avoid the spread of virus through contact with controller. some pathogens can persist in the hospital environment colonizing surfaces, such as doorknobs, faucets, electronic devices, hospital supplies, television remote controls or inanimate objects belonging to patients, such as mobile phones. besides, these objects can be used both inside and outside the hospital and other healthcare settings, and thus can contribute to increase the risk of pathogen spreading.

II. LITERATURE SURVEY

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 paper also showed the effectiveness of the alcohol-based hand sanitizers, which reduced infection rates by whopping 30 percent. They used hand sanitizers with 60 to 70 percent ethanol or isopropanol for reducing significant number of pathogens. The patients were also given about ounce containers of hand sanitizer alongside their beds. For 10-month period of using hand sanitizers showed a result of 36.1 percent infection reduction. [1]



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The infection caused by drug resistant micro-organisms which causes increase in death rate and also complications, the multidrug resistant bacteria include Methicillin Resistant Staphylococcus aureus (MRSA), Extended Spectrum Beta-lactamase (ESBL) producing bacteria, Multi-drug Resistant Pseudomonas aeruginosa (MDRP), which are very common worldwide. Several antibiotics have increasing multidrug bacteria isolation rate, even personal protection equipment (PPE) can't be effective in isolation rate of MSRA. Hence, they emphasize about the use of alcohol-based hand sanitizers since the alcohol-based hand sanitizers had negative association with MRSA isolation rate, which means that hand hygiene is very important in hospitals. [2]

Emergence of the novel Corona-virus (SARS-CoV-2), which has caused unexpected challenges to health of the people of this world, the paper also aims at reducing the transmission rate of the disease. The paper explains about the virus structure and how is it different from that of the bacterial structure, which means that virus has single stranded or double stranded RNA or DNA encapsulated in capsid and virus can replicate only in presence of a host and described as living entities. Bacteria also has almost the same structure including DNA or RNA along with Cell Membrane and can replicate without a host. The paper also gives a complete comparison between hand sanitizers and 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.

III. PROPOSED SYSTEM

Block Diagram

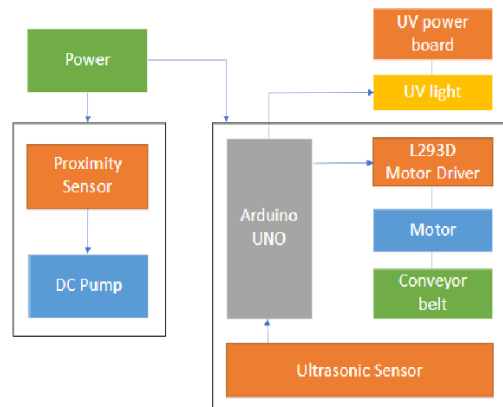


Fig: 3.1 Block Diagram

Hand Sanitizer Using IR



Fig: 3.2 IR Sanitizing Machine

As seen in figure, the motor, control board, and sensor are located at the top of the automatic hand sanitizer device. The device operates by converting the rotary motion of the DC motor to linear motion and pumps out the sanitizing liquid.

The overall size of the automatic hand sanitizer device is 30cm × 30cm × 40cm, and it weighs less than 1.27 kg not including the liquid container. The case in this system was manufactured with PLA using a 3D printer for a lightweight and easy manufacturing process.

Circuit Diagram

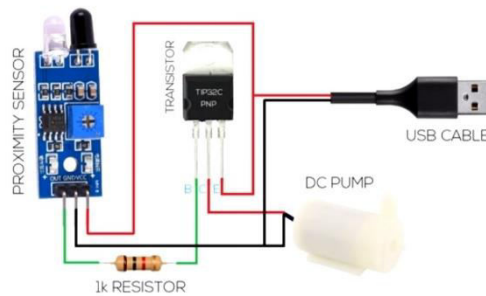


Fig: 3.3 Hand Sanitizer Circuit

The Automatic hand sanitizer device consists of a power supply, sensor, and motor. The power supply provides voltage and current for the operation of the motor. Infrared (IR) sensors beam infrared rays from the light-emitting unit, and it is reflected from the surface of the object and absorbed at a light-receiving unit. If someone moves one’s hand close to the device sensor, the IR sensor detects an object, the IR sensors light turns on, and the DC pump turns on and hand sanitizer container is pumped once. When the IR sensor no longer detects an object, the IR sensor light turns off and the DC pump ceases operation

UV Sanitizer

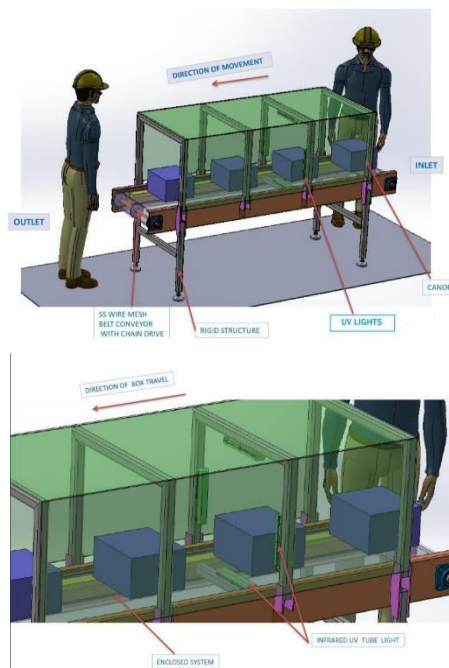


Fig: 3.4 UV Sanitizing Machine

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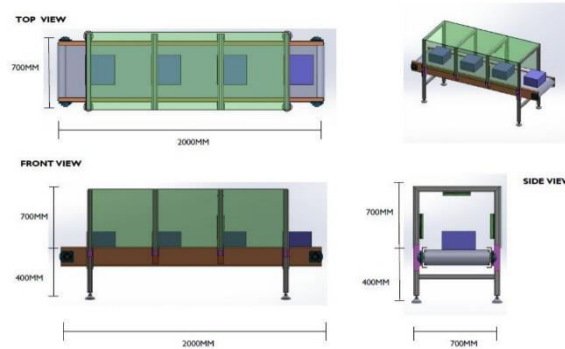


Fig: 3.5 Dimensions of Machine

There will be an ultrasonic sensor at the inlet of the machine and the conveyor belt is provided to move the object from inlet to outlet through canopy as seen in figure. And also, the UV lights are placed inside the canopy. The expected size of the module is 200cm 70cm 110cm. The proposed machine can be placed where ever we need easily and can move to anywhere as we implement scrolling wheel to the machine. `

Circuit Diagram

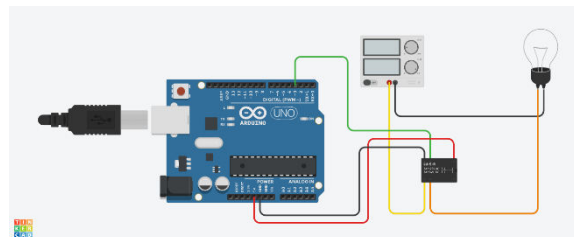


Fig: 3.6 UV Sanitizer circuit

IV. SIMULATION RESULT

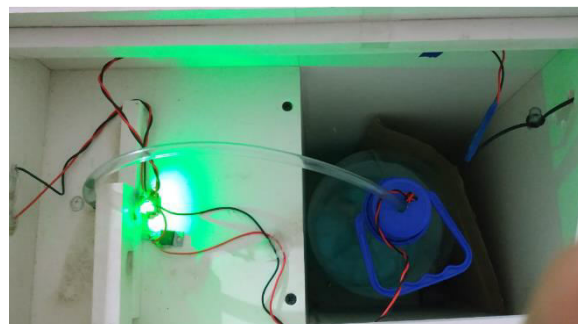


Fig: 3.7 Simulated Hand Sanitizing Machine

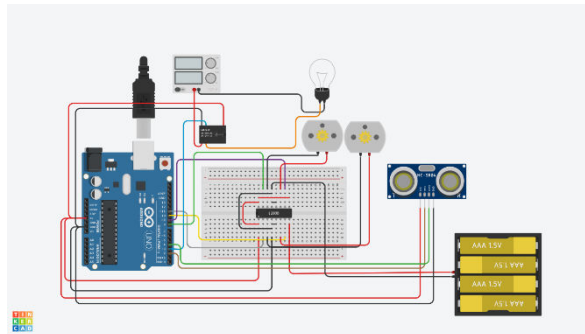


Fig: 3.8 Simulated UV Sanitizing Circuit

V. CONCLUSION

The automatic hand sanitizer device proposed in this paper is ultimately expected to contribute to contact-less hand disinfection in public places and virus infection prevention. With the proposed device, it is possible to avoid many people coming into contact with the pump handle, thus preventing fomite viral transmission and making the use of hand sanitizer much more convenient. Moreover, the system squirts a certain amount of hand sanitizer at all times, making it easy to manage refills and replacement. Furthermore, it can operate compatibly with various designs of sanitizer containers, so consumers do not need repurchase a container for the liquid if they replace the hand sanitizer. Thus, it is economical and eco-friendly by decreasing waste emissions.

VI. ACKNOWLEDGMENT

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