

Touchless Hand Sanitizer Dispenser - San Master

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Abstract— Washing our hands frequently on regular basis will keep infections at bay. We have designed a fully automated sensor-based functioned sanitizer dispenser that is economically affordable and intelligible. The proposed design of touch less hand sanitizer dispenser can be used to progress a decent sanitization approach in the market. This design provides touch less and automatic sanitization, displays information using end users mobile through GSM modem, it also sends message to operator indicating level of sanitizer and announces covid-19 safety measures which promotes health hygiene and cleanliness. Whenever a person comes closer to the device, an Ultrasonic sensor detects the person and displays the information on LCD display. And whenever the hand is detected by the IR sensor it triggers relay which enables solenoid valve and dispense the hand sanitizer as well as it announces covid-19 safety measures. This dispenser can be installed in public washrooms, schools, work places, factories and industries which will reduce the spread of germs. All of the modifications and features made in San-master are likely to make an advancement of hand sanitizer dispenser market.

I. INTRODUCTION

San master is a touch less device which dispenses limited amount of hand sanitizer and automatically refills sanitizer into the bin. This device announces covid-19 safety measures and displays information sent through the user mobile, it also sends message to end user indicating level of sanitizer. Key aspect is to promote health care wellness and safety measures [1].

Hand Sanitizer dispenser is the simple and effective way to sanitize our hands and get rid of germs within few seconds. Manually pressed hand sanitizer brings a large number of people in-contact with each other. Everyone touches the handle at different pressing ratios this will make difficult to replace and maintain dispensing machine. To avoid the viral transmission risk, San master is designed which is touch less, automatic, dispenses limited amount of sanitizer and easy to use.[2]

Ultrasonic sensor and IR sensor are installed to detect the person and hand respectively and to dispense limited amount of hand sanitizer when relay enables solenoid valve. Level of hand sanitizer of bin and bottle are checked with the help of float sensors. Using GSM modem, we can display information on LCD by sending SMS. Covid-19 safety measures are announced through speaker using Voice IC APR3303. Automatic refill of sanitizer from bottle to bin is done whenever sanitizer level of bin becomes low.

Our hands come into contact with a variety of bacteria and viruses throughout the day, washing our hands

thoroughly can help you prevent from deadly virus and spread of germs. Using a dispensing machine eliminates the viral transmission. As the number of cases reported around the world rises, maintaining consciousness is important. As a result, the project's main goal is to create a contact-free and automatic hand sanitizer dispenser and promote Covid-19 safety awareness. San master can be used in Hospitals, Office, Schools, Industries and Public places.

Main aim is to control viral transmission and promote covid-19 safety awareness. Although there are manually pressed hand sanitizers available in the market, there are multiple occurrences of viral transmission impacting individuals throughout the world. To overcome these problems, we created a touch less, automatic, simple and low-cost hand sanitizer dispenser. San master will be more effective in combating Covid-19 virus and viral transmission [3]

- **Homes:** Families have reported numerous positive cases of Covid-19 because they often visit their neighbors and relatives, exposing them to the virus. Installing an automated hand sanitizer will reduce viral transmission and provides prevention to the guests and family.

- **Public Places:** San master can be placed in public washrooms to promote cleanliness. People come into contact in public places and viral transmission is more in these areas. Using a hand sanitizer can eliminate the viral transmission.

- **Schools and Colleges:** There are huge number of people present in these places, therefore students/faculty may be readily infected, and the disease spreads quickly among the people. The hand sanitizer dispenser makes it simple to prevent covid-19 and maintain a healthy lifestyle.

- **Workplace:** In a workplace setting, employees participate in a variety of activities and share their necessary resources, such as laptops, papers, and so on, which might expose them to viruses.

II. PROJECT OVERVIEW

Germs, microbes are on everyone's hand. They spread their hazardous virus to ones that come in contact with. When the news related to COVID-19 was public, sales of the sanitizing gel have rushed all over the world. Hand sanitizer has come to an end in supermarkets and pharmacies throughout the country. Online prices for hand sanitizer surged as a result of the shortage, with some customers stockpiling the product. 80% of all infections are spread by hands. So, it is very vital to maintain a proper health hygiene in all places. Using a dispensing machine is more effective way to stop viral transmission than using a manual hand sanitizer dispensing machine. Manual Hand sanitizer dispensers can bring many people come into contact as everyone presses the pump to dispense the sanitizer. Automatic hand sanitizer dispensers eliminate the contact and makes the process more effective. Using a hand sanitizer dispenser is an ideal solution to prevent viral transmission. [4]

A. Importance of hand sanitizer dispenser

- Hand Sanitizer dispenser is a fast and effective way to kill germs and deadly virus on hands.
- It eliminates the contact between owner and customers.
- Hand sanitizer dispenser is an ideal solution to be placed at any public location like markets, metro stations etc.
- On-site workers and labors come into contact which will rise the viral transmission. Using a hand sanitizer dispenser might reduce the risk.
- Installing a hand sanitizer dispenser will promote health wellness and help us to maintain proper health hygiene.
- Clean hands will make you live a healthy lifestyle.
- Hand sanitizer dispensers can be placed in public washrooms to kill deadly virus and spread of microbes.
- Hand sanitizer dispenses can be placed at exit doors and entrance doors to inhibit the spread of virus.
- Meeting rooms are usually crowded with visitors, staffs, organizers and clients who contacts handshakes and thus switch germs.
- They can be placed in industries, factories, public places, washrooms, schools and colleges. [5]

B. Formulation of hand sanitizer

A hand sanitizer can kill harmful germs on hands and prevents viral transmission. Earlier recommending such formulations for using, WHO sensibly analysed logistical, financial, protection, social, and spiritual concerns. The ingredients used in WHO hand sanitizer gel preparation are selected to balance cost and disinfection action. [6]

C. Advantages and Disadvantages of hand sanitizer dispensers

Advantages

1. *Automatic*: Main advantage of an automatic hand sanitizer dispenser is that it provides automatic sanitization process and automatic refill of sanitizer from bottle to bin. This eliminates the contact point of pressing a pump to dispense hand sanitizer. This makes sanitizer dispenser simple and effective.
2. *Simple to use*: It is very feasible to use, it dispenses hand sanitizer when you place your hand under the spout. IR sensors are installed in the dispensers to detect the hand to dispense the hand sanitizer
3. *Dispenses standard amount of hand sanitizer*: Contactless hand sanitizer dispenser delivers a limited amount of hand sanitizer which is enough to kill harmful germs on hands. It eliminates the wastage of hand sanitizer whereas manual hand sanitizer dispensers dispense extra sanitizer at times when we press it for longer time.
4. *Removes contact point*: Automatic hand sanitizer dispensers eliminate the contact point which will reduce the spread of germs and viral transmission.
5. *Modern appearance*: This hand sanitizer dispensing machine has a modern appearance which brings a glossy look.

TABLE I. HAND SANITIZER FORMULATIONS

Formulation	Required Ingredients (Starting % of Ingredient)	Concentrations in Final Product, % (v/v), (Final % of Ingredient)	Required Volume of Ingredients for 10-L Preparation, mL
1	(i). Ethanol 96%	80	8333
	(ii). Hydrogen peroxide 3%	0.125	417
	(iii). Glycerol 98	1.45	145
	(iv). Sterile distilled water or boiled cold water	—	1105
2	(i). Isopropanol 99.8%	75	7515
	(ii). Hydrogen peroxide 3%	0.125	417
	(iii). Glycerol 98%	1.45	145
	(iv). Sterile distilled water or boiled cold water	—	1923

Disadvantages

1. Power consumption
2. Fire might damage
3. Maintenance

Applications of hand sanitizer dispenser:

- Industries
- Schools & Colleges
- Public places
- Hospitals
- Work places
- Factories

Rise of automatic hand sanitizer dispensers Dispensing machines play a major role to kill the harmful germs on hands. They are available in different shapes, different models depending on users need. Dispensers can be placed in washrooms, public places, schools and colleges. Today, various manual hand sanitizer dispensers and automatic hand sanitizer dispensers are available in the market. Sensor is activated when you place your hands under the spout too dispense the hand sanitizer whereas in manual dispensers, we have to press the handle to dispense the sanitizer on hands. Sanitizer dispensers and can also be used as soap dispensing machines. Automated dispensers are simple, easy and powerful to kill the germs. Using an automated dispensing machine supplies limited amount of hand sanitizer whereas there's a wastage of sanitizer in manual dispensers. It is very easy to use and promotes health wellness.

III. METHODOLOGY

It provides an overview of several steps conducted in this project to verify touch less hand sanitizer dispenser. To stop viral transmission and spread Covid-19 Safety awareness we started by reviewing the importance of touch less and automatic hand sanitizer dispenser. Furthermore, we have reviewed few research papers and made a literature survey. This chapter explains about the design, process and how it works through block diagram, flowchart and circuit diagram. It also tells us about the different tools and modules that were used in this project. [7]

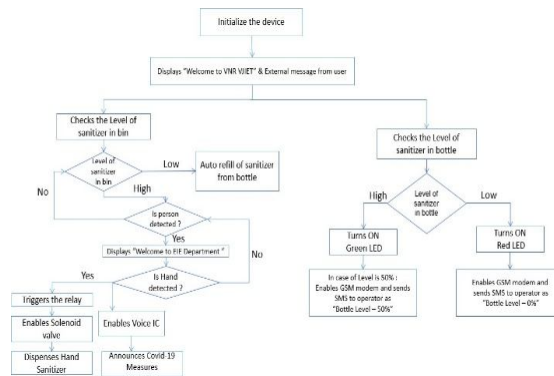


Figure 3.1 Flowchart Representation of SAN-MASTER

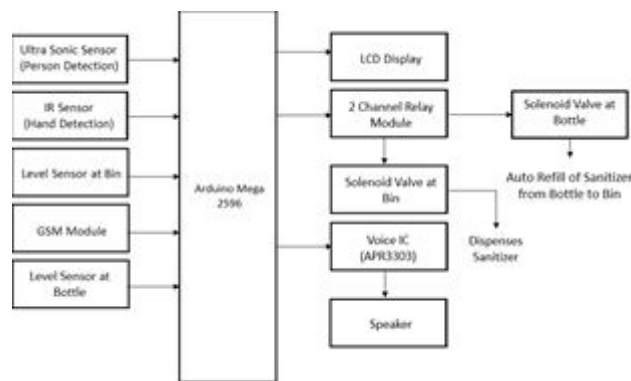


Figure 3.2 Block Diagram SAN-MASTER

Flowchart Overview

- Initialize the device, Welcome message is displayed on LCD screen and it enables data receiving device to display external message from the user.
- Bin and bottle sanitizer level is checked.
- If the level of Sanitizer in the bottle is greater than 25% - it turns ON green LED, if level of sanitizer in the bottle is below 25% - it turns ON Red LED and enables GSM module, sends SMS to operator as “Bottle Level 0%”.
- Checks for Level of sanitizer in bin (Low/High) –
 - Low: Auto refill of Sanitizer from the bottle
 - High: Checks for person detection? (Yes/No)
 - Yes:
 1. Displays as “Welcome to EIE Department”.
 2. Checks for hand detection? (Yes/No)
 - Yes:
 1. Activates relay and allows Solenoid Valve to dispense hand sanitizer on hands.
 2. Enables Voice IC and announces Covid-19 Safety measures through Speaker.
 - No: Again, checks for person detection
 - No: It again checks the sanitizer level until the person is detected.

Block Diagram Overview

- An ultrasonic sensor is installed in this device for person detection. It detects the person by emitting sound waves.
- IR sensor is installed in this device for hand detection. IR sensor emits light to detect hands for dispensing hand sanitizer.
- Level Sensors are placed in bottle and bin to sense the level of sanitizer. Level sensor are placed in a liquid and the pressure on it is given as liquid’s level height.

- It automatically sends message to end user indicating “Bin is empty, please fill it up” using GSM modem and also, we can display information on LCD display using GSM modem. A GSM modem is used to send SMS to mobile.
- Here, Arduino mega is the heart of the device which controls all the functions. This has 54 inputs and 54 output pins.
- 40x4 LCD Display is used in this device to display important information sent through end user. This LCD display has 18 pins.
- Two channel relay module is used to shift electrical devices. Arduino triggers relay and enables solenoid valve to dispense hand sanitizer.
- Solenoid valve at bin dispenses the sanitizer on hands and solenoid valve at bottle is used for auto-refill of sanitizer from bottle to bin. Solenoid valves are generally used to stop or allow fluid flow when they are electrically energized or de-energized.
- Voice IC (APR3303) is used to announce Covid-19 Safety measures. We can re-record our voice using voice IC. Speaker is used for the announcement.

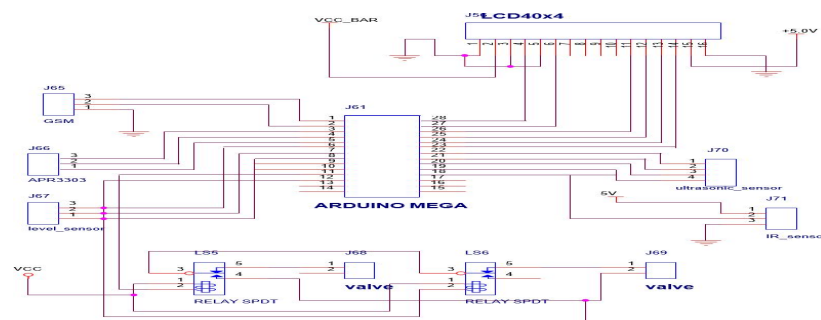


Figure 3.3 Schematic Diagram of SAN-MASTER

Schematic Diagram Overview

Above illustrated schematic diagram clearly represents the modules and tools used in this device and also it tells us about the functionality and interfacing connections with Arduino Mega.

IV. RESULTS AND DISCUSSION

The functionality of hand sanitizer dispenser is evaluated and verified carefully. Evaluation and testing the functionality of automated hand sanitizer dispenser will help us to know the success rate of the dispenser. All tools are interfaced to Arduino mega which is the heart of the device which controls all the functions. All the modules are tested and evaluated. The IR sensor and Ultrasonic sensor are tested at various distances such as 5cm, 7cm, and 10cm. The test was conducted on 10 respondents and the distance between their hands and sensor, distance between device and person are evaluated thoroughly and shown below. [9]

TABLE II. SUCCESS RATE OF SAN-MASTER

RESPONDENT	Success Rate		
	5 cm	7 cm	10 cm
Respondent-1	100%	100%	100%
Respondent-2	100%	100%	100%
Respondent-3	100%	100%	100%
Respondent-4	100%	100%	100%
Respondent-5	100%	100%	100%
Respondent-6	100%	100%	100%
Respondent-7	100%	100%	100%
Respondent-8	100%	100%	100%
Respondent-9	100%	100%	100%
Respondent-10	100%	100%	100%

Above illustrated table clearly shows us that the touch less hand sanitizer dispenser will function efficiently when hand is placed under the spout. Hand sanitizer dispensing rate is 100% as shown in all cases. The distance between the device and target object can be adjusted. It clearly shows that San-master is functioning properly and dispenses standard amount of hand sanitizer.[8]

Output:



Figure 4.1 Welcome message displayed on LCD Display

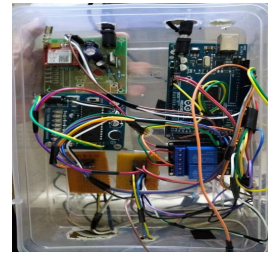


Figure 4.2 Circuit diagram of SAN MASTER



Figure 4.3 IR Sensor detects hand & opens solenoid valve, dispenses sanitizer.



Figure 4.4 SAN-MASTER

V. CONCLUSION

Hand hygiene is now widely recognized as the most significant element, and noncontact dispensing is essential for preventing disease transmission. SAN MASTER is a contactless, automated hand sanitizer that also aims to promote Covid-19 safety awareness via an LCD display and announcement system. It also sends message to end user whenever the level of hand sanitizer is low. We can send information through SMS and display it on LCD. SAN MASTER is simple, inexpensive, and it may be installed in a range of locations, including educational institutions, companies, hospitals, stores, and homes. The hand sanitizer has a feature of auto refill from bottle to bin so the device works continuously. It is considerably safer and more suggested because it has a touch less feature. On the whole, it can be specified that it is an operative armament in the fight in contradiction to this deadly virus and viral transmission. [10]

FUTURE SCOPE

Today, dispensing machines are present in numerous operational modes, sizes and shapes. Some are automated, allowing you to place your hands under the spout to dispense the sanitizer and some are manual dispensers which dispenses sanitizer when one presses the pump. Because soap and sanitizer have comparable viscosities, hand sanitizer dispensers can also be used as liquid soap dispensers. Hand sanitizer dispensers are easy to use and maintain, as well as being cost effective. All the modifications and features installed in San-Master are likely to develop the progress of hand sanitizer dispenser market. In the future, the system may be upgraded with an LED display and the system can be modified in different sizes, price ranges, operational modes and capacities. A touch less and automatic sanitizer dispenser system makes the use of different module technology in the design.[11]

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