Design and Fabrication of Automatic hand dryer with sanitizer Dispenser

Ashitosh More[1], Divya Pandarkar[2], Shreyash Namugare[3], Om ShingadeRadha Singh
Student's, Datta Meghe college of engineering, Airoli
Proffesor, Datta Meghe College of Engineering, Airoli

***Abstract*— Corona Virus disease (Covid19) is wreaking havoc in the world. Ever since WHO announced it as a Pandemic disease and many cities are under lockdown, people are not able to step out of their homes and already thousands have lost their lives. As the global Covid-19 crisis continues to unfold, washing and sanitization of hands have become an absolute necessity in daily affairs. Automatic mist based sanitizer dispensing systems is very useful resource in the fight against corona virus. This contact less dispensing system helps to sanitize hands without getting in contact with the sanitizing surfaces and will help to reduce spread through cross contamination. This contactless dispensing unit sprays alcohol based sanitizer when both hands are placed under it. The aerated mist based formula uses only 5- 6ml. of sanitizer ensuring optimum usage. It releases full cone spray mist for 12 seconds in single operation. Contactless technology works on plc based ir sensor and timer logic to ensure zero touch, high operational precision to completely disinfect both hands at once. It could be wall mountable. The capacity tank ensures longer duration of usage thus eliminating hassle of refilling it frequently. The sanitizer container allows displaying the quantity in it. Also at same time the rotatory table of glass is filled with water while sanitizer dispenser is on so that before someone drink water the person hands should be sanitized.**

I. INTRODUCTION

This dispenser is contactless and will spray sanitizer for sanitization of hands while entering into the buildings like Hospitals, Office complexes, shopping Malls, auditoriums, public places, apartments, schools, colleges, places of work ship other public places etc. There are very few units manufacturing Automatic mist based sanitizer dispensing machine in India. In the present scenario, it is very much important to equip all public places with automatic sanitizer dispensing unit. Due to the spread of Covid-19, there is enough demand for this product.

II. MATH

Suppose for 120 Ah battery,
First of all, we will calculate charging current for 120 Ah battery. As we know that charging current should be 10% of the Ah rating of battery.
so charging current for120Ah Battery = 120 x (10/100) = 12 Amperes.
but due to losses, we can take 12-14Amperes for charging purpose.
suppose we took 13 Amp for charging purpose,
then charging time for 120Ah battery = 120 / 13 = 9.23 Hrs.
but this was an ideal case…
practically, this is noted that 40% of losses (in case of battery charging)
then 120 x (40 / 100) = 48 …..(120Ah x 40% oflosses)
therefore, 120 + 48 = 168 Ah (120 Ah + Losses) Now Charging Time of battery = Ah/Charging Current
168 / 13 = 12.92 or 13 Hrs (in real case).

Therefore, an 120Ah battery would take 13 Hrs for completely charging (with 13A charging current). The SI unit for magnetic field strength H is A/m. However, if you wish to use units of T, either refer to magnetic flux density B or magnetic field strength symbolized as μ0H. Use the center dot to separate compound units, e.g., ―$A \cdot m^2$.‖

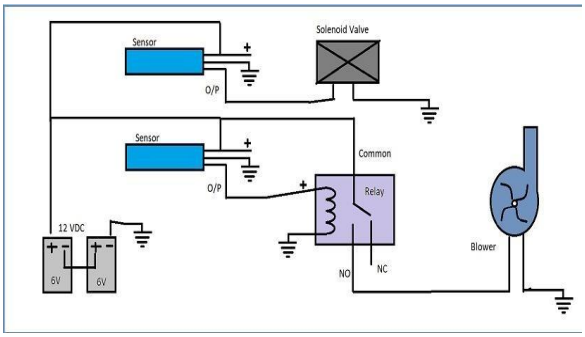
III. UNITS

Battery Chemistry	Lead Acid (VRLA)
Battery Cell Size	12V
Voltage - Rated	12V

Capacity	7Ah
Size / Dimension	5’’* 3’’* 5’’ H
Termination Style	Spade, .187" (4.7mm)
Discharge Rate	2Hr
Standard Charge Current	1.0 Ah
Standard Charge Time	4.5H
Weight	4.2 kg

IV. CIRCUITS AND COMPONENTS

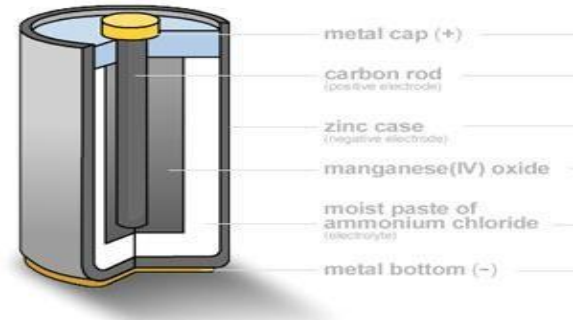
A. Circuits



- The given figure shows the circuit diagram of our project, in the circuit diagram we have done the complete circuit in which have we used 2 sensors of 12-12V, 2 Batteries which have 6-6V each, Solenoid Valve, Relay, Blower.
- The connection is about we can say is that the two ends of batteries positive and negative were connected to each other then one positive end of 1 battery connected to both positive end s of sensors.
- 1 Sensor is connected to a solenoid valve for the sanitizer dispenser and 1 sensor is for the blower. For the solenoid Valve another end of 1st sensor is connected to the negative end of the sensor and its works properly.
- For the 2nd sensor the positive end is connected to the battery other end is for the relay and the blower. For the relay we connected the negative end of the sensor in the positive end of relay in it. Afterwards we connecting the positive end of the sensors towards the relay and through the blower.
- Here is the complete Circuit working figure showing the connection.

B. Components

1. Battery



A zinc–carbon dry cell or battery is packaged in a zinc can that serves as both a container and negative terminal (anode). The positive terminal is a carbon rod surrounded by a mixture of manganese dioxide and carbon powder. The electrolyte used is a paste of zinc chloride and ammonium chloride dissolved in water. The carbon (graphite) rod is what collects electrons coming from the anode portion of the battery to return to the cathode portion of the battery. Carbon is the only practical conductor material because every common metal will quickly corrode away in the positive electrode in salt based electrolyte. The zinc is oxidized according to the following,

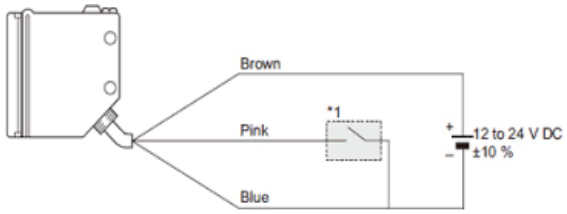
half-equation.
Zn(s) --> Zn2+(aq) + 2 e- [e° = -1.04 volts]

The manganese dioxide is mixed with carbon powder to increase the electrical conductivity. The reaction is as follows :-
2MnO2(s) + 2 e- + 2NH4Cl(aq)-->
Mn2O3(s) + 2NH3(aq) + H2O(aq) + 2 Cl- [e° ˜ +.5 v] and the CL combines with the Zn2+. In this half-reaction, the manganese is reduced from an oxidation state of (+4) to (+3). There are other possible side-reactions, but the overall reaction in a zinc-carbon cell can be represented as:Zn(s) + 2MnO2(s) + 2NH4Cl(aq) ---> Mn2O3(s) + Zn(NH3)2Cl2 (aq) + H2O(l)

The battery has an e.m.f. of about 1.5 V.

2. Laser Sensor

(Laser Sensor)



This sensor is generally used for sensing obstruct in front of it, which operates on 12-24v dc and when it senses the object in front of it its output wire gives 12-24v dc supply whichever is supply voltage.

The laser sensor works based on the triangulation principle. With a laser sensor you can measure the length of a road, a distance's length and positions, without any contact. This happens at a very high resolution. Laser sensors also dispose of various linearities, in addition to the various resolutions.

Laser sensor is a kind of sensor which uses laser technology to measure. It is generally composed of laser, optical parts and photoelectric devices. It can convert the measured physical parameters (such as length, flow, speed, etc.) into optical signals, and then use photoelectric converter to convert the optical signals into electrical signals. Through the filtering, amplification and rectification of corresponding circuits, the output signals can be obtained, so as to calculate the measured quantity.

3. Solenoid Valve

(Solenoid Valve)

Solenoid Valve 24V (DC) RO Water Purifier Solenoid Valve for water filter Purifiers Suited for common RO water filter Purifiers available in India, Compatible with many RO Brands and Models-Can be used in multiple water purifier Models–Counter Top, Desk Top, Stand Mounted,

The application of an air pump is to pump out air. The pumping of air is carried out by an electric air pump Wall Hanging, Under Sink, most of the RO Model cabinets.

Inlet / Outlet	1/4" BSPF
Flow rate	MAX 5 LPM / 300LPH
Valve Type	Normally Closed (0.2 to 8 bar)
Operating Voltage	Normally Closed12VDC

Blower

(Blower)

using electrical energy. Air is pumped by the electric power input, using a pump that uses electricity. To draw air into the pump, the impeller is rotated by an electric motor. In most cases, the air is pushed through an air pump within the chamber. Among the most common examples of electric air, pumps are bicycle pumps used to inflate aquariums and ponds, gas compressors used to drive pipe organs, and pneumatic or air-borne pumps.

4. Sanitizer Tank

V. Procedure

Creating an automatic hand dryer with a sanitizer dispenser using a laser sensor, batteries, sanitizer tank, and blower involves several steps. Here's a general procedure:

1. Gather Materials and Components:
   - Laser sensor
   - Batteries or power source
   - Sanitizer tank with a pump
   - Blower or fan
   - Microcontroller (Arduino, Raspberry Pi, etc.)
   - Relay module (if needed)
   - Housing or enclosure for the device
   - Necessary connectors, wires, and fasteners
2. Design and Prototype
3. Assembly
4. Wiring
5. Programming
6. Testing and Calibration
7. Enclosure and Finishing
8. Quality Assurance and Safety Checks
9. Documentation and User Manual
10. Deployment.

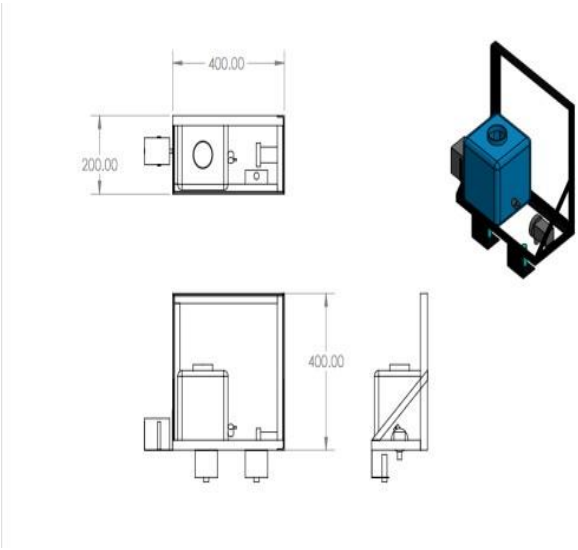
VI. Objective

1. The main objective of project is to avoid covid infection on public .
2. This machine works on very less power consumption
3. We can restrict china projects by making made in india products.
4. Sensor range is very good and adjustable
5. No light effect on sensor

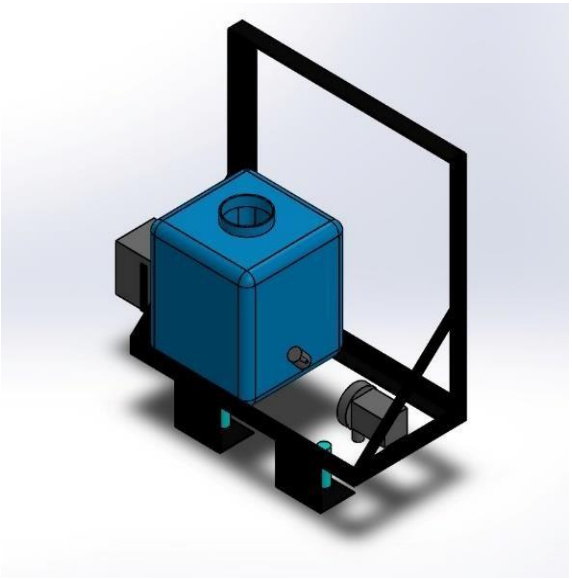
VII. Working

- As we place hand below sanitizer pipe our hand is sensed by laser sensor and this sensor starts solonoid valve in sanitizer pipe.
- As we place hand below Blower our hand is sensed by laser sensor and this sensors startsBlower.
- Sensor, blower, and Solenoid Valve takes power from Battery i.e 12v dc.
- Battery is totally charge with the help of the solar pannel means Solar Pannel charge the whole battery.

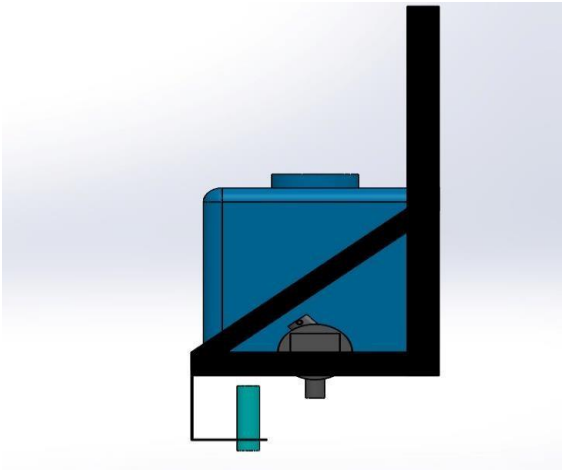
VIII. 3-D MODEL DESIGN



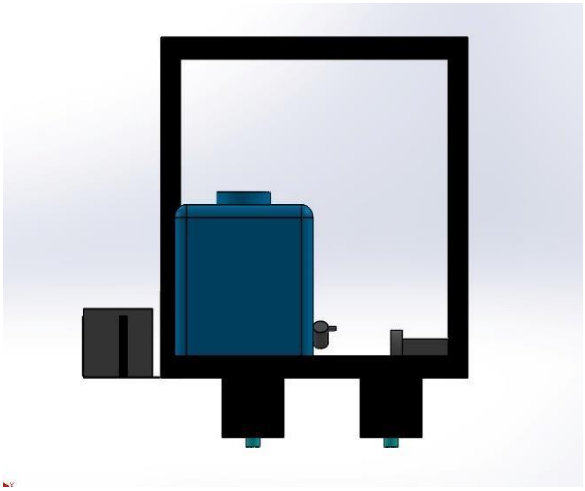
(Structure of 3-D Model)



(Top View of 3-D Model)



(Side View of 3-D Model)



(Front View of 3-D Model)

Elaborating on our SolidWorks design of an automatic hand dryer with a sanitizer dispenser involves providing detailed information about the design process, key features, and functionality of the 3D model. Here's how you can elaborate on your 3D model in our project documentation or presentation:

1. Design Objectives:

- Begin by outlining the objectives of the project, such as creating an innovative and user-friendly automatic hand dryer with an integrated sanitizer dispenser to enhance hygiene practicesin public restrooms.

2. Design Specifications:

- Detail the specific design requirements and specifications for the automatic hand dryer with sanitizer dispenser, including dimensions, materials, and performance criteria.
- Discuss any regulatory or industry standards that influenced the design process, ensuring compliance with safety and usability requirements.

3. Conceptualization:

- Describe the initial conceptualization phase, where you brainstormed ideas and sketched preliminary designs for the automatic hand dryer with sanitizer dispenser.
- Explain how you translated conceptual sketches into 3D models using SolidWorks software, exploring different design iterations and refining the concept based on feedback and feasibility considerations.

4. Detailed Design:

- Provide a comprehensive overview of the 3D model, highlighting its key components, features, and functionalities.
- Break down the design into individual parts and assemblies, explaining their functions and interactions within the overall system.
- Showcase the integration of the hand dryer mechanism with the sanitizer dispenser, illustrating how they work together seamlessly to provide a hygienic hand-drying experience.

5. CAD Modeling:

- Discuss your approach to CAD modeling in SolidWorks, including the use of parametric modeling techniques to create precise geometry and ensure design flexibility.
- Highlight any advanced modeling features or tools utilized in the design process, such as assemblies, mates, configurations, and motionstudies.

6. Visualization and Rendering:

- Showcase rendered images or animations of the 3D model to provide a realistic representation of the automatic hand dryer with sanitizer dispenser.
- Highlight the visual aesthetics and ergonomic considerations incorporated into the design to enhance user experience and aesthetics.

7. Design Validation:

- Describe any simulations, analysis, or testing conducted to validate the design performance and functionality.
- Discuss how SolidWorks simulation tools were utilized to assess factors such as structural integrity, thermal management, and fluid flow dynamics within the automatic hand dryer withsanitizer dispenser.

8. Future Enhancements:

- Conclude by discussing potential future enhancements or iterations of the design, based on user feedback, technological advancements,and market demands.

- Invite suggestions for improvement and collaboration opportunities to further refine the automatic hand dryer with sanitizer dispenser design. By elaborating on your SolidWorks design of the automatic hand dryer with a sanitizer dispenser in this manner, you provide a comprehensive overview of your design process, technical expertise, and innovation capabilities. This can be valuable for project documentation, presentations, or portfolio showcases to demonstrate our proficiency in CAD modeling and product design.of the automatic hand dryerwith sanitizer dispenser.

IX. CONCLUSION

1. Enhanced Hygiene Practices: The integration of a sanitizer dispenser into the automatic hand dryer offers a convenient and hygienic solution for hand drying and sanitization in public restroom facilities. By combining these functions into a single unit, users can maintain hand hygiene effectively without the need for separate devices or additional steps.
2. Streamlined User Experience: The automatic operation of the hand dryer with sanitizer dispenser promotes ease of use and reduces manual effort for users. With intuitive sensor- based activation and precise sanitizer dispensing, the system simplifies the hand hygiene process, contributing to improved compliance with hygiene protocols.
3. Space and Cost Efficiency: The compact design of the automatic hand dryer with sanitizer dispenser optimizes space utilization in restroom facilities, making it suitable for installations in various settings, including airports, malls, offices, and healthcare facilities. Additionally, the integrated design eliminates the need for separate hand dryers and sanitizer dispensers, resulting in cost savings for facility owners.
4. Sustainable Solution: By promoting hand drying and sanitization without the use of paper towels or disposable wipes, the automatic hand dryer with sanitizer dispenser supports environmental sustainability initiatives. The reduction in paper waste and consumable usage contributes to resource conservation and minimizes the environmental footprint of restroom operations.

In conclusion, the Automatic Hand Dryer with Sanitizer Dispenser Project has demonstrated the effectiveness, efficiency, and user-friendliness of integrating hand drying and sanitization functions into a single unit. With its positive impact on hygiene practices, user experience, and environmental sustainability, the system represents a valuable contribution to the field of restroom hygiene solutions.

X. RESULTS

The results of implementing an automatic hand dryer with a sanitizer dispenser using a laser sensor, batteries, sanitizer tank, and blower can be highly beneficial. Here are some potential results and benefits:

1. Improved Hygiene: By integrating a sanitizer dispenser with the hand dryer, users can conveniently sanitize their hands immediately after drying, promoting better hygiene practices.
2. Touchless Operation: The use of a laser sensor allows for touchless operation, reducing the risk of cross-contamination by eliminating the need to touch any surfaces to activate the device.
3. Efficient Drying: The blower ensures efficient hand drying, offering a quick and effective solutionfor users.
4. Sanitizer Dispensing Accuracy: The automated sanitizer dispenser ensures consistent and accurate dispensing of sanitizer, helping to maintain proper hand hygiene standards.
5. Convenience: The combination of a hand dryer and sanitizer dispenser in one unit provides added convenience for users, reducing the need for separate devices or manual sanitizing after drying hands.
6. Energy Efficiency: Proper programming of the device can optimize energy usage, extending battery life and reducing overall power consumption.
7. Versatility: The device can be installed in various locations, including restrooms, kitchens, offices, and public areas, enhancing hygiene practices in different settings.
8. Cost Savings: By promoting better hand hygiene and reducing the spread of germs, the device can potentially lead to cost savings by minimizing the risk of illness-related absenteeism and healthcare expenses.

9. User Satisfaction: Providing a modern and hygienic solution for hand drying and sanitizing can enhance user satisfaction and improve the overall experience in facilities where the device is installed.
10. Health and Safety Compliance: Implementing an automatic hand dryer with a sanitizer dispenser demonstrates a commitment to health and safety standards, potentially improving compliance with regulations and guidelines in various industries and sectors.

Overall, the results of deploying such a device can contribute to a cleaner and healthier environment while offering convenience and peace of mind to users.

XI. REFERENCES

[1] Allegranzi, B., and D. Pittet. 2009. Role of hand hygiene in healthcare-associated infection prevention. Journal of Hospital Infection 73(4):305-315.
[2] Bean, N., J. Goulding, C. Lao, and F. Angulo. 1996. Surveillance for foodborne- disease outbreaks--United States, 1988- 1992.
[3] MMWR. CDC surveillance summaries: Morbidity and mortality weekly report. CDC surveillance summaries/Centers for Disease Control 45(5):1.
[4] Boscart, V., K. McGilton, A. Levchenko, G. Hufton, P. Holliday, and G. Fernie. 2008. Acceptability of a wearable hand hygiene device with monitoring capabilities. Journal of Hospital Infection 70(3):216-222.
[5] Boyce, J. M. 2008. Hand hygiene compliance monitoring: current perspectives from the USA. Journal of Hospital Infection 70:2-7. Boyce, J. M., and D. Pittet. 2002.
[6] Guideline for hand hygiene in health-care settings: Recommendations of the healthcare infection control practices advisory committee and the hicpac/shea/apic/idsa hand hygiene task force. Infection Control and Hospital Epidemiology 23(S12):3-40