

DESIGN AND DEVELOPMENT OF LUGGAGE WRAPPING MACHINE WITH FACILITY OF SANITIZATION

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ABSTRACT

Due to the pandemic scenario of covid-19 luggage safety is important, it is necessary that luggage is not connect with harmful virus and dust, so protecting our luggage from this virus is important not only in airplane travelling but bus, train travelling also by implementing 'luggage wrapping and sanitization machine 'the safety of luggage against this virus is improved, it consist of a frame on which a circular table provided which can be run by low rpm gear motor mechanism, on rotating table luggage is mounted then sanitizer is sprayed on it with help of the spraying nozzle. Then the table is rotate by motor so a thin plastic film wrap is wrapped around it. by covering all side of the luggage and again sanitizer is sprayed on it.

Keyword : - Wrapping, sanitization, Travelling safety, baggage wrapping, Disinfection

1. INTRODUCTION

In a pandemic situation where more number of people affected by the virus by various medium, the one reason of the virus transmission is the physical contact with the virus, the virus is live on the surface at a long time about 28 day according to study [1]. people with traveling in an airplane, bus, train carrying luggage, in this situation if the luggage get contact with the virus this virus can get transfer to the luggage owner and this virus affect traveler and the traveler become sick due to this virus affected luggage and due to sickness of long days the traveler get financial as well as health loss [2]. this project "luggage wrapping and sanitization machine" can be implemented for the protecting luggage from virus and dust, the main process of these project are the first sanitizer is sprayed on luggage then a thin film of plastic wrapping around it.

Annual Growth 4-5% of and 8% in global GDP and give 10% Employment. Covid 19 Crises hits the 7 times impact of 2008 Financial Crises globally decrease in 39% tourism volume. Tourism is first and most impacted industry from covid 19. Sanitization and social distancing is primary concern. Majority events (meetings, Olympics.) cancelled. All Business Travelling shrink in online meetings. Most Sectors prefer Automation and least human Contact. People prefer quality than Quantity. There were new Challenges for stake –holders when all sectors in recovery to make new action plan and also take risk and crises management plan which will help in any future crises.

This luggage wrapping and sanitization machine also used for wrapping the box, pallets etc.

2. METHODOLOGY

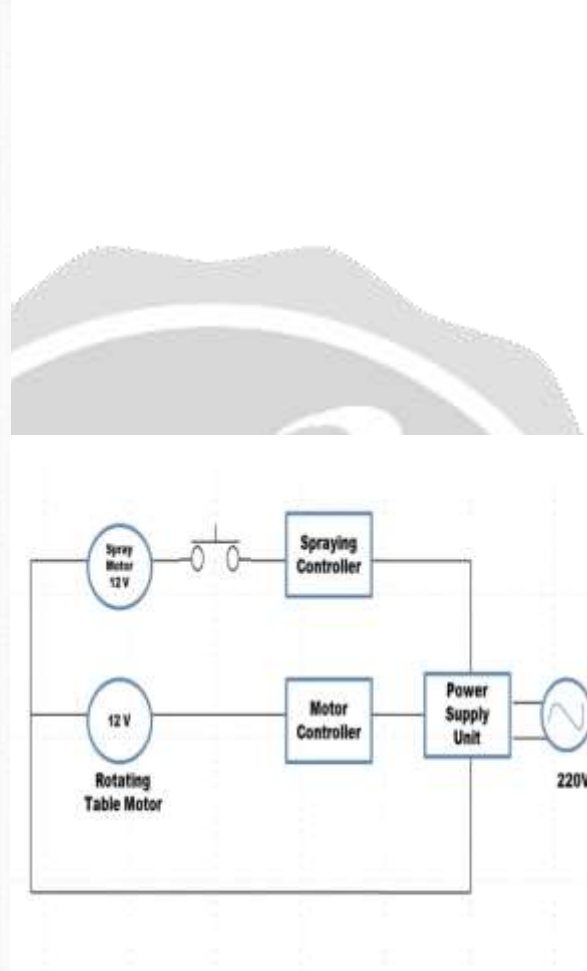
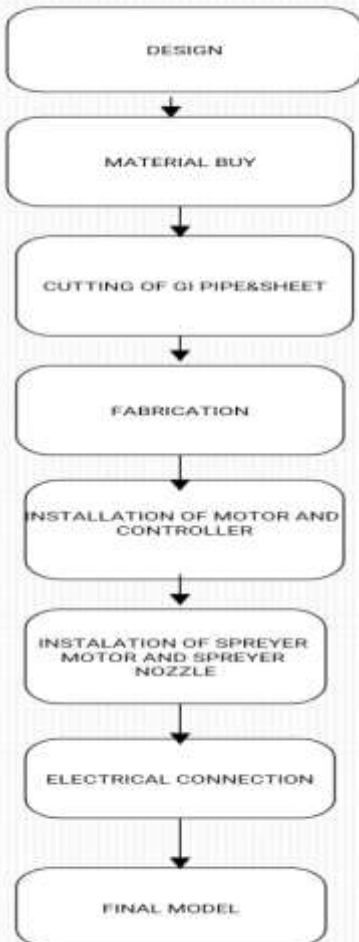


Figure1: Planning

Figure2: Electrical circuit

As Shown in Fig 2 Spraying Controller and Motor controller both are connected parallel with Power supply unit. Spray motor (12v) and rotating table motor is also connected with Respective controllers. Whole circuit diagram is connected with 220v Ac Supply.

2.1 Design

Taking Project Length (l) =1200mm, Height(h) =900mm, width(b) =500mm

- For Making Rectangular Upper frame
Length of the Frame (l) =500mm
Height of the Frame (h) =700m
- Total Length Of Material For Upper Frame
=4(700) +4(500)
=2800+2000

=4800 mm

- For Making Lower Rectangular frame
 Length Of the Frame (l) =1200mm
 Width of the frame (b) =500mm
 Height of the frame (h) =200mm
 Total Length of the material for lower Frame
 $=4(1200)+4(200)+4(500)$
 $=4800+800+2000$
 $=5800$ mm

- For Making Door
 Length Of the Door (l) =500mm
 Height Of the Door (h) =700mm
 Total Length of Material For the Door
 $=2(500)+2(700)$
 $=1000+1400$
 $=2400$ mm

- For Covering The upper Rectangular Frame
 Length Of the frame(l) =500mm
 Height of the Frame (h) =700mm
 Total area required for covering upper frame
 $=3(500)(700)+1(900)(500)+1(500)(5)$
 $=1050000+450000+250000$
 $=805000$ mm²
 $=8.66$ square foot

- For Covering Lower Rectangular Frame
 Length of the Frame(l) =1200mm
 Width of the frame(b) =500mm
 Height of the frame (h) =200mm
 Total area required for covering lower frame
 $=2(1200)(200)+1(500)(700)$
 $=480000+350000$
 $=830000$ mm²
 $=8.93$ square foot

- Total GI Sheet Required

$$=805000+830000$$

$$=1635000 \text{ mm}^2$$

$$=17.59 \text{ square foot}$$

- Material Required For Motor Supporting Frame
 - Length (l) = 500 mm
 - Total Length =2(500) mm
 - =1000 mm

- Material Required For Making Stand For Wrapping Roll
 - =(b)+(h)
 - = 500 +500
 - =1000 mm

- Total Material Required for Complete The Frame
 - = 4800+5800+2400+1000+1000
 - =15000 mm
- No Of Self Drilling Screws Required =100 approx
- Diameter Of Rotating Table
 - Width of the base (b) = 500mm
 - Diameter Of Rotating Table (D) = 400mm
- No Of Caster Wheel Required =4

2.2 Design implementation

- By Design calculation required material are bought out from local market as well from online. Buying Item should be As under in estimated Price. Buying Material on The same day benefit in Time and Transpiration cost also.
- After buying Material and tools material Cutting Process Carried Out as per as per required material for proposed Model. Make sure All the Process has Done with Safety Equipments.
- After Cutting Material second step is Fabrication Of The Project Frame and its Enclosure..With help of Welding and Self Drilling Joined GI sheet with Frame.
- Make sure proper current and Voltage is supplied into welding Machine. And Ensure Drilling machine have high Torque for penetration of the screw.
- After Completion of Frame motor and electrical are carried out. Firstly make hole in sheet and Fix controller and MCB in it. After it Motor is Fixed in the Slot.
- The Rotating table is attached to motor with Coupler and screw. Sprayer Pump is mounted at Bottom of the platform joined with 2 hose Pipe. (one for Spraying connected to nozzle and second is connected to reservoir of sanitizer).
- Once installation Is done Next step is to connect motor and controller with power supply with the help of wire.

2.3 Objective

- Main objective is to disinfect luggage from harmful viruses by sanitization.
- Protect luggage from rough handling
- Protect luggage from spilling food
- Make machine is economical than existing.

3. MODELING AND ANALYSIS

- **Main components**

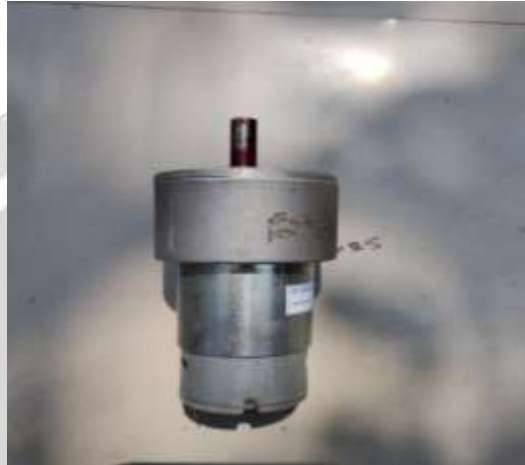


Figure3: Gear motor

A gear motor is used for rotate the table on which luggage is placed; it should be produce high torque to for rotating luggage.



Figure4: Stretch wrap

A stretch wrap is very thin stretchable plastic film which is used for wrapping the luggage.



Figure5:12v sprayer pump

A 12V sprayer pump is used for spraying disinfectant on the luggage with the help of nozzle



Figure6: Gear motor speed controller

It is used for controlling speed of rotating table by changing current gear motor.



Figure 7: Final working model

3.1 Material List

SR NO.	ITEM	QUANTITY
1	GI PIPE 1 INCH	40ft
2	GI PIPE 0.5 INCH	20ft
3	GI SHEET	40sq ft
4	MCB	1
5	MCB CASE	1
6	WIRE TAPE	1
7	CABLE	2 m
9	WIRE	9m
10	PUSH SWITCH	1
11	3 PIN TOP	1
12	CASTER WHEEL	4
13	SCREW	100
14	DOOR CLAMP	2
15	DOOR HANDLE	1
16	SPREYER NOZZLE	1
17	TEFLON TAPE	1
18	CLAMP	4
19	SPRAYER MOTOR	1
20	GEAR MOTOR 12-24V, 550 MOTOR GEAR VERSION	1
21	10 AMPS 775/795 MOTOR SPEED CONTROLLER	1
22	12V 10AMPS 120 WATTS SMPS FOR 775/795 MOTOR	1
23	SPEED CONTROLLER SPREYER	1
24	GEAR MOTOR FLANGE COUPLER	1

4. RESULTS AND DISCUSSION

From this project minimum rotating table rotation is 3 RPM and maximum table rotation is 36 RPM, and usage of wrapping film is depends upon size and shape of the luggage.

MAX RPM OF THE ROTATING TABLE	35 RPM
MIN RPM OF ROTATING TABLE	3 RPM
NO LOAD CURRENT	0.53 A
STALL CURRENT	5.22 A
TIME REQUIRED FOR WRAPPING LUGGAGE	2 Minute
REQUIRED SANITIZER PER BAG	50 ML
REQUIRED WRAPPING FILM PER BAG	1 METER

5. CONCLUSION

In accordance with the needs of tourist, a luggage wrapping machine with facility of sanitization is design and developed. Structural design for rotating unit, wrapping unit and sanitization facility indicate that this automatic wrapping machine can meets the need of current situation. This project is most useful in an airport, bus port, and railway station for wrapping luggage of passengers. This project is also useful in packaging industries for wrapping the boxes.

6. REFERENCES

- [1] Khan, M.H., Yadav, H. "Sanitization During and After COVID-19 Pandemic": A Short Review. *Trans Indian Natl. Acad. Eng.* 5, 617–627 (2020).
- [2] Tauqeer Hussain Mallhi, Yusra Habib Khan, Nasser Hadal Alotaibi, and Abdulaziz Ibrahim Alzarea "Walkthrough Sanitization Gates for COVID-19: A Preventive Measure or Public Health Concern?" *The American Journal of Tropical Medicine and Hygiene*, Volume 103: Issue 2, June 2020
- [3] Daniel Klein, Markus Stommel, Johannes Zimmer, "Influence of the stretch wrapping process on the mechanical behavior of a stretch film" *AIP Conference Proceedings* 1960, 120012 (2018)
- [4] Liqiao Li, Defu Wang, Xing Yang, "Study on round rice straw bale wrapping silage technology and facilities" *Int J Agric & Biol Eng.* 2018; 11(4): 88–95.
- [5] Daniel Klein, Markus Stommel, Johannes Zimmer "Constitutive modeling of the mechanics of polyethylene films in stretch wrapping processes" *AIP Conference Proceedings* 2113, 130001 (2019);
- [6] Qawasmih, Naseem; Abu-Awad, Ahmed "Semi-Automatic Wrapping Machine For Pallet" <http://scholar.ppu.edu/handle/123456789/1045,01/05/2020>