iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** V **Month of publication:** May 2023

DOI: https://doi.org/10.22214/ijraset.2023.52552

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

Design of Sensor Based Semi-Automatic Cotton Wick Packing Machine

H.K. Shete[1], Sahil Shirwadkar[2], Rohan Thombare[3], Viki Waghmare[4], Shambhuraj Lavand[5], Sunil Sankpal[6]
[1]*Assistant Professor,* [2, 3, 4, 5, 6]*UG Students, Department of Mechanical Engineering, Dr. Daulatrao Aher College of Engineering, Karad*

Abstract: ***Many small scale cotton wicks production businesses process of packaging their product manually. The packing process is carried out with the help of candles. This process is very time and effort consuming. This system aims to develop such a machine which automatically packs the cotton wicks with the help of microcontroller and sensors. The purpose of doing this project is to reduce human efforts and time consumption. The machine design is based on simple mechanisms and it can be installed easily. As this machine will reduce the labour cost time and efforts, more production in minimum time is possible. This type of packing machine is used for both small scale and large industries. This machine can be easily transported from one place to other.***

Keywords: Heat Seal; Semi-Automatic Packing; Cotton Wick Packing.

I. INTRODUCTION

The stable and cash crop of India is Cotton. As its plays an important role in the industrial and agricultural economy of our country. It provides cotton to cotton textile industry for various purpose. Cotton in India provides direct livelihood and people are employed in cotton business and its processing. From the cotton, cotton wicks is the most consumable product in the India, as our country has cultural values. Manufacturing of cotton wick in earlier year was manmade but now there are mechanized machines for production of wicks.

High consumption and production of cotton wicks, needs its packing in suitable requirement, which is big task. In an packing machine, the primary requirement is to protect the wicks from damaging and also it protects from the light, heat and the other factors. For this system, main task is to pack cotton wicks in the different sizes.

In this packaging system, plastic sheets are used for packing cotton wicks. It also attracts the buyers and also differentiate the product from others. For this system main task is to packed cotton wicks, and have used 3 types of packing as small, medium and large then having used these 3 types because of customers demand and also due to their size. In this packaging system, polythene bags are used for packing cotton wicks.

The packing machine are of many types out of which 80% are semiautomatic and remaining are operated manually, but the problem is that the packing size cannot be varied, in these semiautomatic cotton wick packing machine. For this reason , there is necessary to design and develop semi -automatic packing machine to avoid above problems.

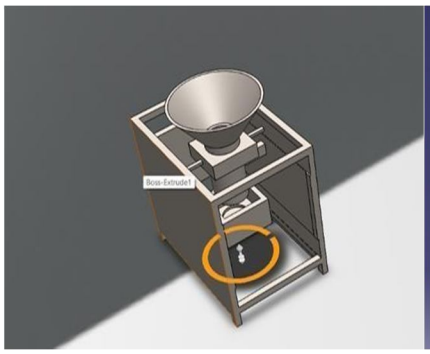
II. METHODOLOGY

Following are the methodology's to develop design of sensor based semiautomatic cotton wick packing machine.

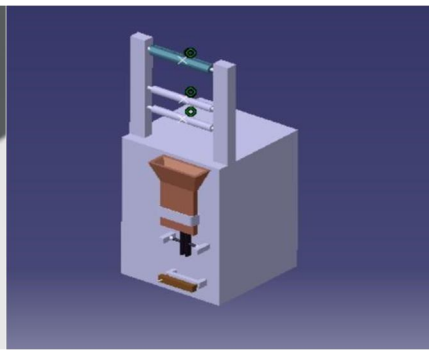
1) Literature Survey
2) Making of Design using CATIA
3) Collecting the required components after making the list.
4) Manufacturing
5) STAGE 1
    a. Making of the uppermost hopper which will be used for storage.
    b. Opening closing mechanism for the hopper.
6) STAGE 2
    a. Then those cotton wicks vertically and horizontal packing is done.
7) Programming on Arduino Uno .
8) Attaching the funnel below the packed cotton wicks so that it directly falls in it.

©IJRASET: All Rights are Reserved

III. OPTIMUM SOLUTION



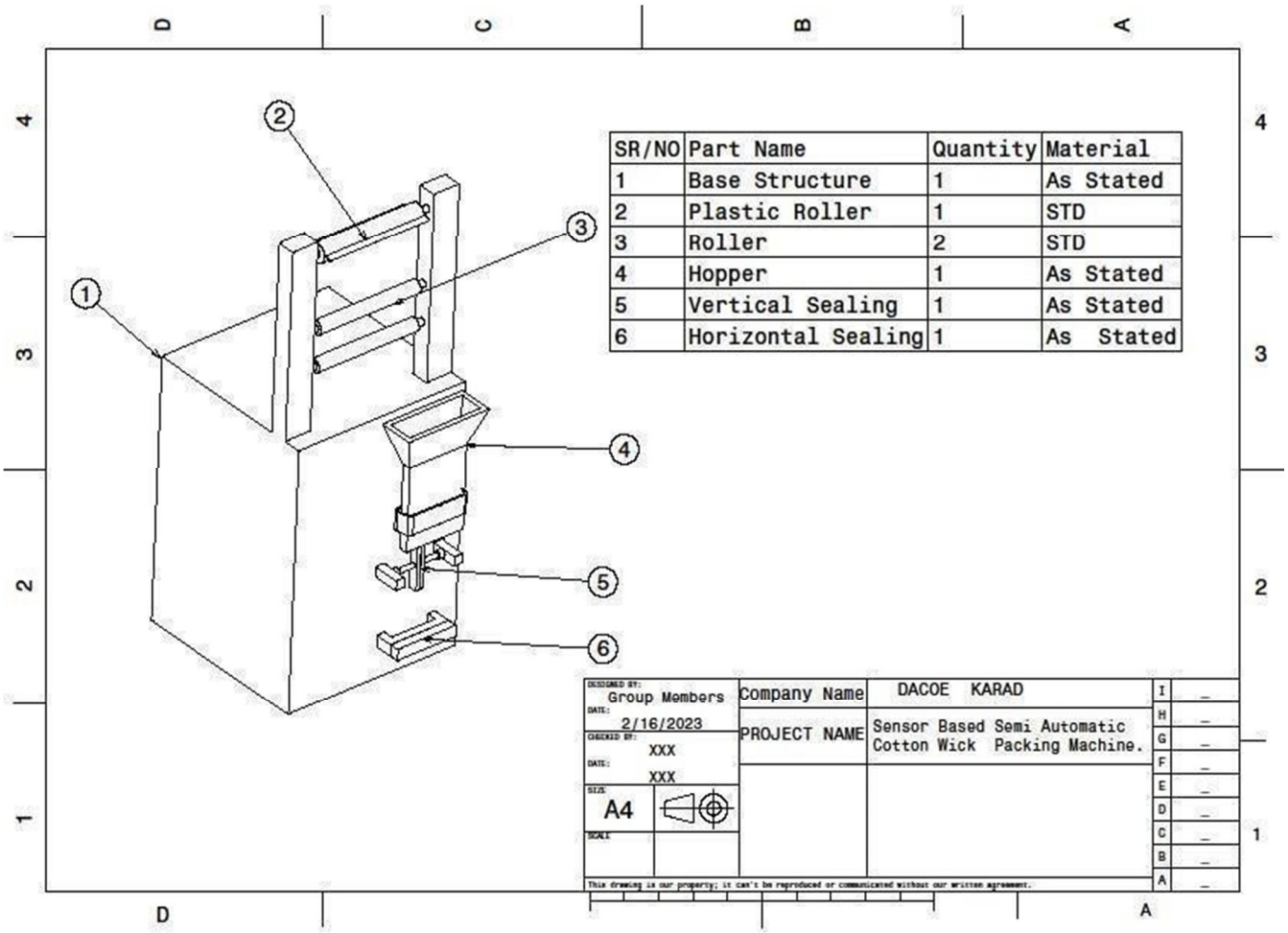
DESIGN NO. 1



DESIGN NO. 2

1) *Design No. 1:* In above design the problem is that hopper size cannot be varied and it cannot be fully automatically controlled, as cotton wicks are manually dropped into the hopper.
2) *Design No.2:* In Design no. 2 hopper size can be varied and it can be fully automatically controlled. Also packing size can be varied as per our requirement , finally we have selected Design No. 2 for our system ,as it can vary predefined sizes.

IV. DRATING OF DESIGN SOLUTION -



DESIGN NO. 3

A. *Specifications*

1) Operation Semi – Automatic Process.
2) Fully MS Material used for manufacturing.
3) Operating System Pannel Digital ie Control by Microcontroller.
4) Dimensions – 130mm*510mm*1400mm.
5) Bag Size - 0-135mm (W)* 0-200 (L)
6) Weight: 75 Kg
7) Accuracy – 0.5 + -
8) Sealing Type – Horizontal And Vertical Sealing.
9) Hopper Size – 5 kg.
10) Speed 12- 30 Bag\ min
11) Voltage – 110 v |220 v
12) Stabilizer Compulsory
13) Output shaft supported by two ball bearings

V. COMPONENT

A. *Hopper*

The Hopper is a container that tapers downward and collect the cotton wicks deposited at the bottom. It is used to store the cotton wicks which will be dropped down for packing . As the hopper aslo helps in pulling down the plastic rolls . It is coller in shape . The reason for using hopper in these types of machines is, due to it tapering shape at the bottom, the amount of material falling from the container can be controlled, making the process more uniform. Hopper increases the collection quantity. Hopper walls are coated and protect the materials inside it from contamination.

B. *Ultrasonic Sensor*

An ultrasonic sensor is a device that used for detecting the cotton wicks and converts the reflected sound into electrical signal. And due to this plastic rolls are pulled down for packing.

C. *Arduino Uno Board (Microcontroller)*

A micro-controller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output boundary . The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. Arduino uses its own IDE (Integrated Development Environment) uses as amplified version of C++, making it easier to learn to program Here developed automation technique using Arduino Board and increase the speed and accuracy of the process of production.

D. *Stepper Motor*

A stepper motor, phase motor, or other brushless DC electric motor. It is utilised to lower the plastic roll towards the sealing portion (both vertically and horizontally sealed). As long as the motor is suitably sized to the application in terms of torque and speed, the position of the motor can then be instructed to move and hold at one of these steps without any position sensor for feedback (an open-loop controller).

DC motors that move in distinct increments are called stepper motors. They have several coils that are arranged into "phases" or collections. You can regulate speed and/or location with extreme precision using computer-controlled stepping. Stepper motors are the preferred motor for numerous precision motion control applications as a result.

E. *Keypad Kit and LCD*

The keypad is used to give desired length of packing bag. The keypad is used to give the desired input temperature for packing. It will also show the total no of packets that are finished. A command is an instruction given to LCD to do a task like initializing it, clearing the screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the screen.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

F. Heat Sealing Jaws

A machine called a heat sealing jaw is used to apply heat to seal goods, packaging, and other thermoplastic materials. Heat sealing can combine two materials that are similar or dissimilar, one of which includes a thermoplastic, by joining them together. For our method, the temperature needed to seal plastic bags larger than 50 microns is between 160 and 200 °c.

As they use one or more heated bars, irons, or dies which contact the material to heat the interface and produce a bond, hot bar sealing jaws have heated tooling held at a consistent temperature. To avoid sticking to the hot tooling, the bars, irons, and dies can have different configurations, be coated with a release layer, or use a variety of slippery interposer materials.



Fig No. 4

Benefits of sealing by jaw:

1) 0% chance of Product Leakage.
2) Suitable to seal any kind of pouch without leakage.
3) No chance of product contamination.

VI. PROCEDURE

The process is completed in 3 steps. In first step, input value is given; the amount of material of the given input value is dispensed from the hopper to the funnel. In this step, a rotating disc will act as a step consist of a miniature vacuum pump which will broaden the opening of the bag, so that the filling operation will be eased. In second step, the main work is of sensor which senses the wicks falling into hopper , as it is placed near the hopper . In third step the will be separated from the machine. The only task which the operator has to perform is to give the input value and collect the pouch after the process is done.

VII. WORKING PRINCIPLE

An working of automated packaging device is based on microcontroller. This system includes a hopper that collect the cotton wick, and is easily separated from the machine. The cotton can be released from the bottom of the hopper. The cotton wicks is then sensed by an ultrasonic sensor, which is then pushed downward for vertical sealing and horizontal sealing respectively. With the aid of a microcontroller, it transforms mechanical energy into electrical energy. Cotton wicks is delivered via a dial, which displays the value on an LCD display. The paper roll is pulled down for packing cotton wicks which is controlled by stepper motor. The stepper motor are used because they provide stable speed control even with the fluctuating load and offer constant torque over a wide range of speed. The content dispensed from the hopper is filled into the ‘Paper Bags’. These bags are automatically dropped down after packing in the container.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

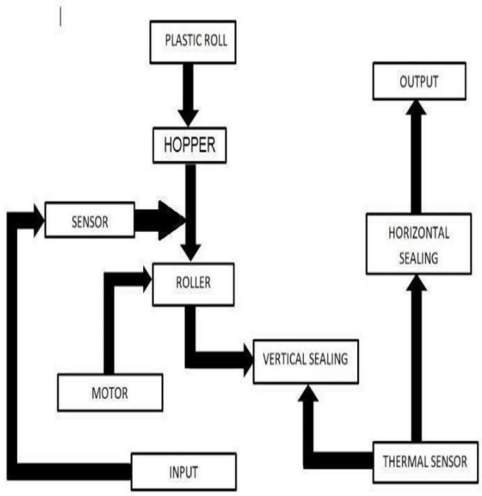


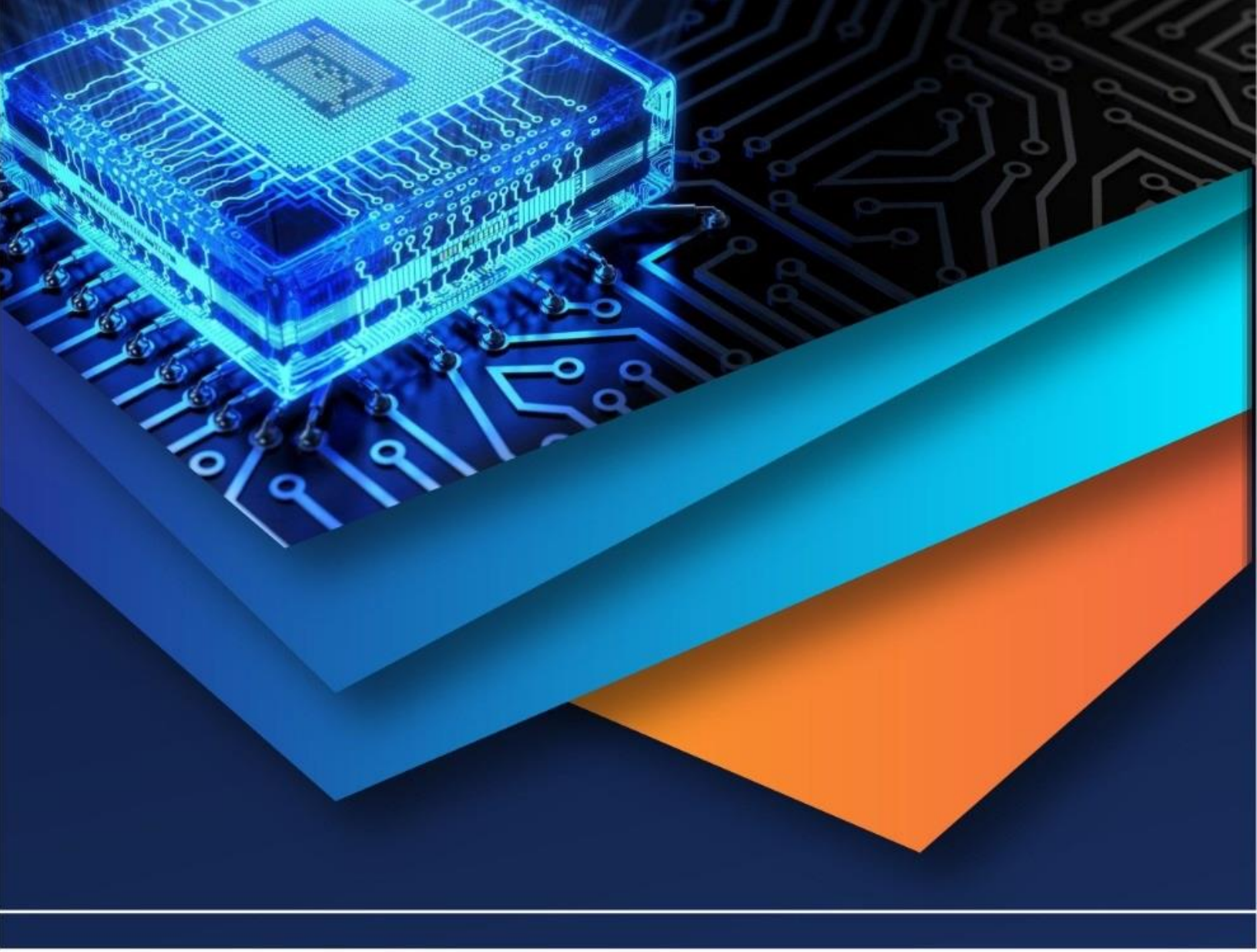
Fig No. 5

VIII. CONCLUSION

This machine is used for both small industries and large scale industries. This machine is used for packing cotton wicks of various sizes. Sensors are used for this machine for packing. This machine is simple to operate and you will want to verify that the device maintains a constant output with each action. This machine has appropriate controls, and is capable of producing wicks of high quality.

REFERENCES

[1] Tawanda Mushiri, Charles Mbohwa, International Conference on Operations Excellence and Service Engineering Orlando, Florida, USA, September 10-11, 2015
[2] Prajakta Hambir, Nimish Joshi, Pranav Karande, Amol Kolhe "Automatic Weighing and Packaging Machine" International Research Journal of Engineering and Technology (IRJET) Volume: 06 Issue: 05 May 2019 [2]
[3] Birgit Geueke*, Ksenia Groh, Jane Muncke, - 'Food packaging in the circular economy: Overview of chemical safety aspects for commonly used materials'-May 2019 -Volume-06 ,Page Number-2134
[4] Agnes L. Karmausa, Ron Osbornb, Mansi Krishanc, - 'Scientific advances and challenges in safety evaluation of food packaging materials: Workshop proceedings'-May 2019- Volume-06, Page Number2134
[5] Mr. Abhishek Shigwan, Mr. Pankaj Shirke, Ms. Snehal Ukarde, Ms. Priyanka Salaskar, Mr. Guru Bhurshe, Mumbai - 'Automatic Packing Control machine'-05 June 2021-Volume-08,Page Number- 342-343
[6] Alhade A. Algitta, Mustafa S., Ibrahim F., Abdalruof N. and Yousef M., titled as 'Automated Packaging Machine Using PLC' IJISET - International Journal of Innovative .
[7] Said Elshahat Abdallah and Wael Mohamed Elmessery, titled as 'an innovative low-cost automatic prototype for fruits and vegetables weight basis packaging', Misr J. Ag. Eng., 35 (1):169-198 January 2018
[8] M. R Saraf, V. V. Ruiwale, V. V. Kulkarni and S. M. Kulkarni, International Journal of Current Engineering and Technology (E-ISSN 2277 –4106, P-ISSN 2347 – 5161), Special Issue-4 (March 2016)
[9] Shashank Lingappa M., Vijayavithal Bongale, Sreerajendra, International Journal of Advanced Mechanical Engineering.ISSN 2250-3234 Volume 4, Number 7 (2014), pp. 803-811
[10] Said Elshahat Abdallah and Wael Mohamed Elmessery, titled as 'an innovative low-cost automatic prototype for fruits and vegetables weight basispackaging'Misr J. Ag. Eng., 35 (1):169 – 198, January 2018.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)