

Automation & Low Cost Workstation for Bag Stitching Machine

P. G. Mehar¹ Dr. A. V. Vanalkar² V. D. Dhopte³ Dr. A. P. Ninawe⁴
S. G. Bawane⁵

¹Department of Mechanical Engineering, K D K College of Engineering, Nagpur, 440024, M S, INDIA

²Department of Mechanical Engineering, K D K College of Engineering, Nagpur, 440024, M S, INDIA

³Department of Mechanical Engineering, K D K College of Engineering, Nagpur, 440024, M S, INDIA

⁴Department of Mechanical Engineering, K D K College of Engineering, Nagpur, 440024, M S, INDIA

⁵Department of Mechanical Engineering, K D K College of Engineering, Nagpur, 440024, M S, INDIA

Abstract: In order to avoid use of plastic bags alternative cotton, jute, paper bags and other smart materials can be used as environmental friendly bags. An automated and low cost bag stitching machine is proposed here. This machine is compared with non-woven bags manufacturing system and feasibility analysis is carried out. This machine would be capable of manufacturing the whole bags by itself with minimal human interface. Here a conventional stitching mechanism is used and using automated and low cost workstation a complete mechanized system is proposed. This innovative system can be considered as a start-up and will be helpful in rural as well as urban use.

Key words: Automation, stitching, conventional, bags.

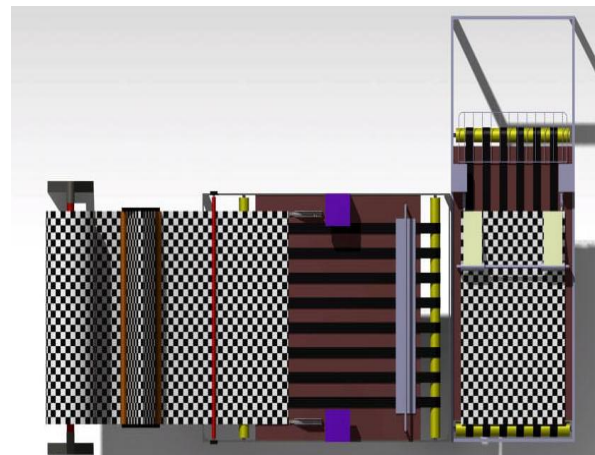
Date of Submission: 08-04-2026

Date of acceptance: 21-04-2026

I. Introduction

As plastic is banned in most of states in India .It is now necessary to find out the best alternative for it. The alternative is in the sense of material like cotton bags, jute bags, non woven bags, paper bags ,etc. and the method of making those

bags. In this highly competitive world it is very important to find the solution in very chipper and easy way for the manufacturer and to the customer. There are the several manufacturer for manufacturing Non woven bag making machine. The non woven fabric contain some plastic resins. It uses hot press operation for sticking two layer of non woven fabric as it contain fabric which is then lead to low strength of that bag. The main limitation of non woven bag machine is, it has high installation cost of machine and very low per bag profit margin on sell. It has very low carrying capacity which is around 10-12 kg as is is just sticks to the handle. This limitation is get overcome in AUTOMISED BAG STITCHING MACHINE . In this bag stitching machine, it used the stitching operation instead of sticking operation. The stitching operation is being done manually in existing model of bag stitching machine, which again lead to human fatigue and time consuming operation. In atomized bag stitching machine, the operation like unwinding, folding, cutting, stitching, box making,etc. are to be done in atomized way.

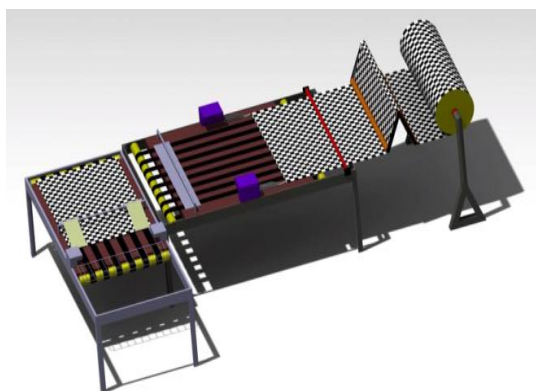


Problem Formulation : In AUTOMISED LOW COST BAG STITCHING MACHINE WORKSTATION,all problem are get covered and made best utilization of resources in every aspect like:

- Man power
- Space utilization
- Initial investment
- Time consuming operation

Formulation :

- As in manual machine, bag is made in various stage it will lead to more time and cost consumption which will improve in our machine, bottom folding, cutting, box shape stitching, etc. are done on L-shape table workstation.
- The various machine operation like stitching, cutting, folding, is controlled by the microcontroller, so that it will become fully automatic which will lead to less fatigue to the operator which is the biggest problem in manual bag stitching machine.
- The size of our machine is very less as compare to non woven bag making machine by which it take less floor space for installation.
- The installation cost and maintenance cost of this machine is much less as compare to other machines.



- The production rate of this machine is control by controlling the motor speed by using motor driver and microcontroller , so that it is used for batch as well as job production.
- As the design of machine is simple and of low cost, so the initial investment of this machine is much more get reduced.
- As per unit bags cost of this machine is get reduced through which the profit made by the selling bags is more as compare to non woven bag making machine.

The constructional details of automised bag stitching machine workstation are as follows:

It consist of following element:

- Table
- Sewing machine
- Motor
- Belt conveyor
- Cutting mechanism

- Lifting mechanism
- Folder
- Motor driver
- Microcontroller

Table:

The table is made up of SAE 1020 angles of 65×65×6 mm and 30×20×5 mm Angle. Firstly cut 2 piece of 712 mm, 4 piece of 500mm, 2 piece of 1500 mm of 65×65×6 mm angle. The frame of 500×300 of angle 30×20×5 mm angle is welded between 500-712mm and 500-1500 mm as shown in fig. Four pedestal bearing is bolted at four corners of a table. The iron rod with 4 pulley and 2 pulley set is fitted in the pedestal bearing. The conveyor belt is mounted on the that pulley. The motor is fitted at bottom of the table which is connected to the v shaped pulley by the v-belt. The iron sheet of 18 gauge is screwed to the table top frame.



Sewing Machine :

The sewing machine is placed on the table in 30×20×5mm angle frame of size 500×300 mm. It has adjustable length 800-900 mm width. The speed of machine is controlled by the 1/12 HP motor which has 9000 rpm .we used 4 sewing machine on that frame of table.



Motor :

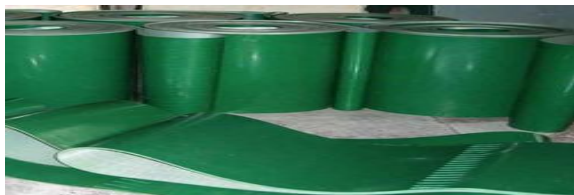
The motor is used to give the power to the sewing machine. Two motor like 0.5 HP motor is used for the conveyor belt, four 1/12 HP motor is used for the sewing machine, one stepper motor is used for the cutting mechanism, one DC motor is used for the cutter blade to rotated at particular speed. The L298N motor driver and UNO microcontroller is

used for adjusting the speed and timing of operation of the motor.



Belt Conveyor

The conveyor belt of size 3 meter with 100 mm width and 3 mm thickness is used to carry fabric material over a central distance of 1412 mm. The 0.5 hp motor is equipped with motor driver and microcontroller is used to give power to the conveyor. Here the flat pvc belt is used which has the gripping material on one side to have grip over the flat pulley.



Cutting Mechanism :

The cutting mechanism is used to cut the bag fabric to the required shape. One DC motor is used to rotated the cutting blade which has 2000 rpm. The stepper motor is used to give the linear movement in forward and reverse direction with the help of lead screw. one guiding steel rod is used to give support to the DC motor with cutter.



Lifting Mechanism :

The lifter mechanism is equipped with stepper motor to lift the fabric in required position so as to give required box shaped stitching to the bag. It is place near the sewing machine of the second table.

Folder :

The folder is used to fold the bag fabric to the required width. Folder is made up of 22 gauge iron

sheet. The four shaped cut out of the sheet is get gas welded as shown in fig. The folder is placed just before the each sewing machine.



Motor Driver :

The L298N motor driver module is a high voltage dual H-bridge manufactured by ST company. It is designed to accept standard TTL voltage level. It is used to control the all DC motor and stepper motor. The motor driver is program by the microcontroller.



Microcontroller :

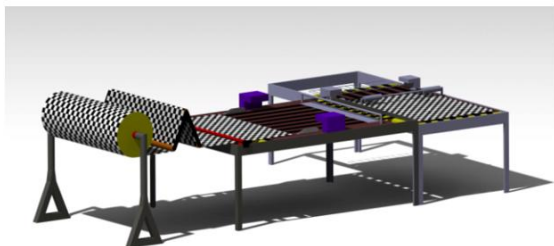
Arduino Uno is a microcontroller board based on the ATmega328p(datasheet). It has 14 digital input/output pins(of which 6 can be used as pwm output), 6 analog input, a 16 MHz quartz crystal, USB connection, a power jack, an ICSP header and reset button. The UNO R3 microcontroller is used for various operations like timing of turn ON and turn OFF of motor by using the motor driver. The use of microcontroller makes the whole machine automated.



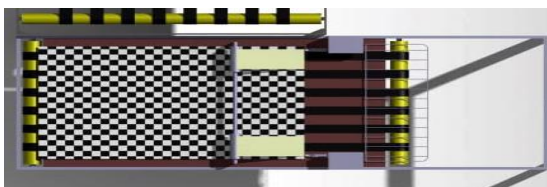
Working :

The operation perform on this machine are like unwinding, folding, stitching, cutting, box making, etc. the fabric is get first unwind from the roller by applying the pressure by the roller. The fabric is then pass through the various roller shaped as triangle as shown in figure. After that the unwind fabric is then pass over the belt conveyor and pass to the folder. The 25 mm width ids get fold from both side of the fabric by the folder before it goes to the sewing machine for stitching. After folding the

fabric to the required size width it goes to the sewing machine for the bottom stitching.



The stitching operation is done of 420mm length of the fabric which takes 10 to 12 seconds. Then the sewing machine is stop for 10 seconds for cutting. The rotating type cutter is used to cut the fabric to required dimensions like after 900×420 mm fabric. The 900 mm distance is covered by the cutter by lead screw mechanism which is operated by the stepper motor. After cutting to required size, it is then pass to the another table with the help of belt conveyor.



Now the fabric is move to the another table, where the further operation is get perform. The fabric is move forward by the belt conveyor. The side supporting fabric is then placed on the cut out fabric. The size of the side supporting fabric is 350×200 mm which put 25 mm away from the side of fabric. Then the main fabric is get fold in folder which is placed before the sewing machine As shown in fig. Then the both over layered fabric is going to the stitch by the sewing machine and the lifter grill is used to lift the up the fabric, the continuous stitching is done and it takes the box shape. The final shape like 420×350×200 box is made.



II. Conclusion :

Here , a new concept for designing and fabricating the **AUTOMISED LOW COST BAG STITCHING MACHINE WORKSTATION** is presented. It has many advantages like initial cost of machine, installation cost, maintenance cost, are

less as compare to non woven bag making machine. The build quality is very tough as it is made up of heavy MS angle.

This machine may be the start up option or great opportunity for the existing small scale industry to work with this machine as its initial cost and installation cost is very less as compare to other machine.

Here , we can see lots of mechanical mechanism practically like folding mechanism, belt conveyor, stitching , cutting mechanism , lifting mechanism, and lots of electronics devices like motor, motor driver, microcontroller, etc.

References :

- [1]. BHAVIK.R.LODHA “DESIGN AND DEVELOPMENT OF LOW COST AUTOMATION SYSTEM FOR POUCH PACKAGING” International Journal of Mechanical And Production Engineering, ISSN: 2320-2092, Volume- 3, Issue-8, Aug.-2015
- [2]. N. R. Patil “Automated Paper Bag Making Machine” May 2017 | IJIRT | Volume 3 Issue 12 | ISSN: 2349-6002
- [3]. Vinod M. Bansode “Design and Analysis of Automated Packaging Machine for Industrial Applications” Journal of Science and Technology, ISSN: 2456-5660 Volume 06, Special Issue 01, August 2021,
- [4]. https://en.m.wikipedia.org/wiki/Conveyor_belt
- [5]. <https://www.makerlab-electronics.com/product/l298n-dual-h-bridge-motor-driver-module/>
- [6]. <https://howtomechatronics.com/tutorials/arduino/arduino-dc-motor-control-tutorial-l298n-pwm-h-bridge/>
- [7]. <http://www.rottaprintindia.com/non-woven-bag-making-machine.html>
- [8]. <http://www.rtmachinery.in/cutting-sewing-machine.html>
- [9]. https://www.google.co.in/amp/s/www.engineeringtoolbox.com/amp/ansi-steel-pipes-d_305.html
- [10]. http://www.mahavirsteel.com/ms_round_bars.html
- [11]. <http://www.microbluebearings.com/bearing-size-char>