

A RESEARCH ON DEVELOPMENT & FABRICATION OF AUTOMATED PAPER BAG MAKING MACHINE

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ABSTRACT - We need small size bags every day for various purposes like grocery, fruits, and vegetables. We use plastic bags for such purposes. Plastic shopping bags have a surprisingly significant environmental impact for something so seemingly innocuous. Plastic shopping bags kill large numbers of wildlife each year. One of the most dramatic impacts is on marine life. So to avoid above harmful effects of Plastic Bags, we have fabricated a low cost paper bag making machine to reduce the usage of plastic bags in all the necessary fields. The plastic bags are used on large scale due to their cost and easy manufacturing than paper bags, cloth or other eco-friendly bags. In this report presents the design and development of a system to automate the procedure of paper bags production so as to make its production cost low as comparable to plastic bags. The project has been implemented controller, sensors and DC motors which kept the cost of the system significantly low and have automated the manufacturing process.

Keywords: Paper bag, Sensors, Economical, Startup, Pollution control.

INTRODUCTION

Plastic have major disadvantages for environment, so there is dare need to replace it. Though there are machines available for making paper bags are bulky, big in size and also they are not fully automatic, they require human interaction. Also cost of this machines is so high which is not affordable to small scale business.

Due to the increasing awareness of the hazards of plastic bags to the environment among the public and the ban imposed on plastic bags throughout India and abroad by the governments, there is a great demand for paper bags. Due to the bio degradability of paper and its origin from nature source, it has got an additional scope for the purpose of this machine.

MECHANISM USED

The main mechanism involved in fabrication of automated paper bag making machine is the folding mechanism for folding the paper into number of turns and the another one is feeding mechanism is to feed the paper through the roller for which following factors are taken into account.

The size of A4 size paper = 210 × 297 mm

The weight of A4 size paper = 80-90 gsm

The thickness of A4 size paper = 0.05 mm

The length of A4 size paper = 297 mm

The rule given by the Gallivan's Paper Folding Theorem, which relate the length of the paper, its thickness, and the number of times it can be folded. Gallivan's formula for the minimum length is:

$$L = \frac{\pi}{6}(2^n + 4)(2^n - 1)t$$

Where t is the thickness of the paper and n is the number of folds.

For feeding the paper through rollers, friction plays major role to pass the paper through roller so keeping the view of following friction consideration that propagate the further mechanism.

Friction between two plastic rollers which is taken into account = 0.4μ

Percentage of moisture content on A4 size paper = 4 - 4.5%

Static friction of A4 size paper = 0.50–0.65 μ

Kinetic friction of A4 size paper=0.35-0.50 μ

WORKING PRINCIPLE

A paper of A4 size is feed through the feeder roller which is designed in such a way that it feeds single paper at a time. The paper moves forward on the platform through a set of roller (operated by motor and gear arrangement). A sensor is set up just after the setoff roller arrangement which sends signal to the feeder mechanism and stops till the next raw paper is required. The glue brushes are mounted next to the set of roller arrangement under which paper passes and glue gets applied on both sides (left and right) of the paper. As the gluing operation is done another sensor sends signal to the flap mechanism and the folding of paper takes place where it get proper envelop shape. The paper pouch is manufactured, an automatic pinion arrangement (driven by sensor and gear arrangement) pushes the envelope out of the machine and get collected in collection area.



COMPONENT USED

1. Wooden ply board(for base or frame of the machine)
2. DC geared Motors(2 johnson motor 100rpm , 1 normal motor 100rpm)
3. PVC pipes(for roller)
4. Bearing(used at the end of roller for rolling)
5. Servo motor(for sliding the bag into collecting area)
6. 2 limiting switches
7. Sensor(for detecting paper movement)
8. Jumper wires
9. Glue sticks
10. Micro controller
11. Transformer(3 ampere)
12. Relays

SELECTION OF MATERIALS

In the context of product design, the main goal of material selection is to minimize cost while meeting product performance goals. Systematic selection of the best material (Table 1) for a given application begins with properties and costs of candidate materials.

Parts of Machine	Material used
Body or frame of machine	Wood/ ply board
Rollers	PVC Pipes
Roller support rod	Stainless steel

PROCESSES INVOLVED IN FABRICATION

Cutting: The fabrication starts with the cutting process which has cutting of ply board with hand-saw or electric hand-saw machine which is a cost effective process and safe process.

Drilling: Drilling is the process that uses the drill bit to make a hole of circular cross section in solid materials. The drill bit usually a rotary cutting tool often multi pointed. Instead the hole is usually made by hammering a drill bit into the hole with quickly repeated movements.

Fastening: Fastening is the temporary joining process that employs additional elements to mechanically assemble or attach two or more parts together. Additional mechanical elements that are also used for fastening is called fasteners.

ADVANTAGES

- The paper pouch of sufficient size and strength can be manufactured.
- It helps to reduce or eliminate the use of plastic bags.
- It occupies less space and consumes less electricity.
- The machine is easy to operate as all the function is automatic once paper is feeded.

RESULTS

- The machine is capable of producing paper pouch efficiently and within less time than conventional use.
- The paper pouch manufactured by machine is having enough strength for the use of keeping small items.

FUTURE PROSPECTS

- As we all know we are aiming to ban use of plastics bags completely and focusing on the substitute of polythene bag so this machine is capable to meet the future demand of alternative to plastic bag.
- As the machine is efficient and fast working the machine is ready to produce that quantity of paper bag which will be required.
- The paper pouch produced by this machine can be used in pharmaceutical, stationary, confectionary, and personal use.
- As the cost of this machine is so affordable so it supports startup as earning for the others.

CONCLUSIONS

The excessive use of plastic bags leading to hazardous impact on environment stating the reason for not getting the alternative of plastic bags and easy availability in less cost.

The earlier designed paper bag making machine shows some scope for modification so that the availability of paper bag can be achieved in desired cost with the increase in efficiency as well as low cost of production machine.

REFERENCES

1. International Journal of Applied Research 2017; 3(46): 1088-1094 by Ranjeeta Kakoti.
2. IOSR Journal of Humanities and Social Science (IOSR-JHSS): e-ISSN: 2279-0837, p-ISSN: 2279-0845 by Vigneshwaran. R, Dr.B.Arun kumar.
3. International Research Journal of Engineering and Technology (IRJET): Volume: 06 Issue: 06 | June 2019 by Akash Borude ; Ashutosh kamble; Pradeep Gaikwad.
4. International Journal for Research in Applied Science & Engineering Technology (IJRASET): Volume 7 Issue IV, Apr 2019 by D.M.Kalai, Pratik D. Kamble, Shubham S. Kamble.
5. International Journal for Scientific Research & Development: Vol. 7, Issue 02, 2019 by Shubham Bodekar, Abhishek Gawade.