

Design and Fabrication of Cost Efficient Paper Bag Making Machine: A Review Paper

Amol Pardhi¹, Akshay Tikapache², Rohit Golar³, Sandesh Meshram⁴, Deepak Nikuse⁵, Rohan Raut⁶, V. N. Borikar⁷

^{1,2,3,4,5,6} Student, Dr. Babasaheb Ambedkar College of Engineering & Research, Nagpur

⁷ Asst. Prof., Dr. Babasaheb Ambedkar College of Engineering & Research, Nagpur

Abstract- In this paper, we have proposed a cheap, portable paper bag making machine fabricated to produce paper-bags and reduce the uses of plastic bags for green and safe society. The system is semi-automatic which is capable of producing a paper-bags from drawing sheets. The system can be implemented in a small scale industry for producing paper bags and it will automatically minimize the trends of plastic bags.

Index Terms- Semiautomatic Paper bag, Portable.

INTRODUCTION

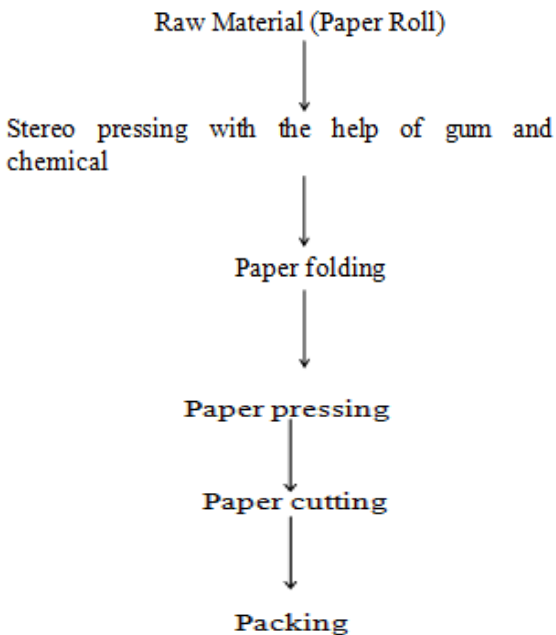
Plastic, although considered as one of the greatest inventions by virtue of its use in carrying things has become a major element in polluting the environment. It is almost impossible to destroy plastic bags. Plastic bags remain in the soil for centuries, defiling the soil, preventing it from replenishing its nutrients, and rendering to barren. This ultimately results in fertile land becoming barren and turning into desert. It is estimated that the life expectancy of plastic bags is around 250 years. In current scenario, the use of plastic bags for every single work has become a usual thing. Right from buying grocery from market to shopping in malls everywhere plastic bag is been used. The use of plastic bags ranging from 20 to 50 microns across the country has increased, and it is continuously increasing. Paper bags on the other hand, come from wood, which comes from trees, which grow in the earth's soil. The trees needed to make paper bags are considered renewable resources. That means more trees can be planted to fulfill the gap of trees that are cut down to make paper and other products. Once paper is made, it can be recycled and used to create more paper goods. Bags made from paper are biodegradable and hence highly environment friendly

than plastic bags, which pose a threat to the environment. Throughout India people make paper 2 carry bags by hand in their homes as per the local demand. Generally women in the family take up the paper bag business as a second source of income. Children in the family support in making bags. The major problems are long and tedious working hours, difficulties in sourcing raw materials and man power, meager market, low profit margin, insecurity in getting regular orders etc. Hence the use of paper bags is promoted nowadays. The paper bags of varied designs are seen easily, but the design is not satisfactory to overcome the tensile strength of plastic bags. Also the paper bags being manufactured are made from raw materials from start. Hence the cost of production of paper bags rises and the paper bag manufacturing industries thus face a lot of problem regarding its sale in market. The paper bags are eco friendly, they does not affect the flora and fauna of the environment. Despite of lots of adverse effects of plastics bags on the surrounding it is being widely used due to the ease of manufacturing and very low cost. On the other hand although the use of paper bags are being promoted yet there is no considerable market for paper bags due to complex machines and high cost of manufactured product. This project is based on reuse of papers for manufacturing paper bags instead of using recycled papers. It also aims on switching traditional manual method of paper bag manufacturing to low cost semi-automated system in order to achieve the goal of mass production of paper bags through automation. Due to mass production, the cost of the final bags is expected to be low as compared to the paper bags available in the market made by traditional manual method.

LITERATURE REVIEW

Report by Mech. Division, MSME Development Institute, Solan (HP), Explain that The material from the unwinder is folded into two and fed into the machine. The material is typically cut by using a hot knife which seals and cuts simultaneously. The bags are sealed only at the sides and hence the name side seal machine [2].S. Shashank et al. Explain that currently the system can produce 1 paper-bag per minute. This is because of the 5V DC geared motor used in entire system. Also glue needs to be replaced frequently. Further one human assistance is required. However, the machine can be deployed in small scale industries, homes, etc. and the paper-bag can be used for carrying vegetables and fruits, for small stationeries, can be used in medical shops for carrying medicines, etc [6].N. R.Patil et al. Explained that that main purpose of this study was to automate paper envelope machine in order to reduce the man power and to increase the efficiency and quality of the product and ultimately to increase the preparedness to face emergency situations [1].

MANUFACTURING PROCESS



Design of paper paper bag machine:

Due to a Chinese factory’s pressing need to increase the speed of paper clip packaging and decrease operating costs. A machine that would fold boxes and load them with paperclips was designed. In the stage mechanism the paper may fall out of the linkage

unless the coefficient of friction between the linkage and the box is high enough or another mechanism serves to stabilize the paper.

The following manufacturing process is as follows:

1. Unwind Section

Film unwind is responsible for unwinding film in the form of a roll into the machine while maintaining film tension. In certain machines unwind sections can be a static mandrel (un-powered) type and use either a pneumatic brake or friction brake to control unwind action and provide applicable film tension. In other machines unwind mandrel will require variable frequency control (VFD), servo control or DC gear motor type control. It can be either be surface driven or centre driven configuration.

In the unwind section often there are roll change features, such as dual mandrels, roll lifts. The unwind section will also include the film tension and / or dancer. The dancer can provide a speed feedback (analog or discrete) to the unwind control circuit, as well as a film accumulator area for bag index purposes.



Fig. Unwind Section

2. Dancer

The dancer maintains tension when continuous movement of web is changed to intermittent motion. Tension maintained due to help of the dancer is very important to the function of the machine, principally the accurate feeding of the web [3].

The dancer has two sets of rollers one of which is stationary and the other is movable. The web is routed alternatively between the static and mobile roller sets. The movement of mobile roller set is restricted by using linear springs, pneumatic or servo systems which primarily help in maintaining the tension required. Linear transducers, potentiometers or capacitive sensors are used to provide the position feedback of the roller sets.

3. In-Feed

The in-feed is responsible for drawing material from the un-winder section and passing it on to the feeder section. It is especially critical in machines where the un-winder is a static mandrel. It helps to isolate the continuous web motion of the unwind section from the high dynamics intermittent motion of the feeder section.

It consists of two rubber lined rollers which are pressed against each other by pneumatic cylinders and the material is pinched between the rollers. The rollers which are coupled by gears at their ends are driven in opposite directions by a single motor. Typically they are driven by VFD control but in certain very high speed machines they are servo control driven.

4. Feed Control:

Material from the in-feed / unwind is fed to sealers and cutters by the feeders. Feeders ensure the bags of correct length are fed at the right time. They also respond to feedback from print mark sensors to guarantee printed web is fed to the right position. Feeders should move the web only when the cutter/sealer is open position. They also work in tandem to maintain the tension between them so that all accessories mounted between them can work well. The feeder consists of two rubber lined rollers which are pressed against each other by pneumatic cylinders. Material passes between the rollers and held by the pressure exerted between the rollers. These rollers which are coupled by gears at their ends are driven in opposite directions by a single motor. They are normally driven by servo motors as they need high dynamics [high speed and high acceleration / deceleration] and high accuracy.

5. Tension control

Web tension at different locations of the machine is maintained by diverse mechanisms. Web tension between the feeders is maintained by adjusting the feed ratio between Feeders. Dancers facilitate to maintain tension in certain places. Some materials tend to stretch when they are hot. Web tension is sometimes relieved /reduced after the sealers to prevent stretching.

6. Cut/Seal Control

Cutter/sealers are moved up and down during production of the bag. This section is the heart of a bag making process as the bag gets sealed and/or cut here. The design of this section will determine the machine type.

The oscillatory motion is sometimes achieved by using a mechanical cam driven by induction motor. In these machines this is the primary axis to which all other axis is synchronized. It is critical in such places to get the position feedback of the mechanical cam by using an auxiliary encoder coupled to the Cam. In certain configurations servo motor and drive combination is used to achieve this motion. Servo solution provides higher flexibility, accuracy and speed compared to the VFD solution.

CONCLUSION

We have been able to design and develop a semi-automated Paper bag making machine for different objectives. Compensating for the shortcomings of other already available systems, our work is not only of good feasibility, high efficiency, but also with high robustness. Main purpose of this study was to automate paper envelope machine in order to reduce the manpower and to increase the efficiency and quality of the product and ultimately to increase the preparedness to face emergency situations.

REFERENCE

- [1] N. R. Patil, Jonathan Lobo, etal, "Automated Paper Bag Making Machine", IJIRT, Vol 3, Issue 12, ISSN: 2349-6002, May 2017, 20-24.
- [2] Paper carry bag Mech. Division, MSME Development Institute, SOLAN (HP)
- [3] Bag making machine, Allen Bradley, Rockwell Automation.
- [4] Margaret E. Knight, "Paper Bag making machine", US Patent No. 116842.
- [5] William R Purvis, "Paper Bag making machine", US Patent No. 434461.
- [6] S.Shashank, Rajath, Nayan Kumar .V, Harish A.G, S.M. Narasimhan. "Portable Paper-Bag Making Machine", in International Journal of Engineering Science and Computing, Volume 7 Issue No.4, April 2017.
- [7] Mangesh M. Daundkar, Mrs. Bhairavi N. Savan. "An Optimized Embedded System for

Automated Paper Bag Production”, International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) ISSN: 2278 – 909X Volume 5, Issue 1, January 2016.

- [8] ThivankaKasunGunawardena,PRDadigamuwa and B G D A.Madhusanka, “Low Cost Automated Machine for Paper Gathering and Folding” in European Journal of Advances in Engineering and Technology, 2015, 2(2): 4043 Research Article ISSN: 2394 – 658.
- [9] Subramanian Senthilkannan Muthu, Yi Li, J.Y. Hu, PhD1, P.Y. Mok,Xuemei Ding, “Eco-Impact of Plastic and Paper Shopping Bags” , The Hong Kong Polytechnic University, Institute of Textiles & Clothing, Kowloon NA HONG KONG,College of Fashion, Donghua University,Shanghai, China.X.
- [10] Md. Abdul Jalil, Md. NannuMian, Muha, “Using Plastic Bags and Its Damaging Impact on Environment and Agriculture: An Alternative Proposal” International Journal of Learning & Development ISSN 2164-4063.