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DESIGN AND FABRICATION OF ECOFRIENDLY MINI PAPER BAG MAKING MACHINE

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ABSTRACT

Bags have become the most prominent thing to carry regular materials like Food stuffs, small scale items etc and are also used sometimes for packaging purpose. Plastic bags account for majority of all such bags. In spite of all the hazardous impacts of usage of plastic bags they are produced and used on large scale in our country, India. One of the major contributor to the environmental problems is plastic bags. These are used by the retailers as plastic bags are cheaper than any other type of bags like cloth, paper etc. This paper presents the designing and fabrication of Mini Paper Pouch Making machine to produce economical paper bags which are made compulsory to use by government in cities like Mumbai. Our aim is to manufacture Paper Pouch on low cost simple machine which in turn reduces the cost of manufacturing.

Key-words: Bags, Mini paper, Ecofriendly

INTRODUCTION

Small size plastic bags have been used by us every day for various purposes like grocery and small house hold items. Shopping bags made up of plastics are pernicious to environment with a significant effect on wild life too. Not to forget, the most significant effect is on marine life.

In order shun the above dangerous effect of plastic bag on our environment, a feasible alternative is required. The most feasible alternative that is economical is paper bag. Paper bags are being used but not on the large scale. The reason for this cited to be the special kind of paper required to make the paper bag which increases it's cost. Conventional paper bag making machine has high machine investment cost. These reasons checks it's small scale production.

All the present limitations of the conventional machines are eradicated in a proposed design. These design does not require special paper and has low initial investment cost and can be used for small scale production. Poor families can be benefitted by small scale production of paper bag. These proposed design is aimed to make paper bag from newspaper to reduce it's cost. Recycling of such bag is easy and one can earn small amount of money by selling it to a scrap vendor after it's use. These has reduced the wastage.

Government efforts in trying to reduce impact of plastic bags on our environment has been our strong hold as we are trying to outcast the plastic bags.

Following are the environmental effects of plastic bags :

- Precarious environment for animal and specially marine life
- Consumption of plastic bags proves to be fatal to the animals, as plastic bags are commonly mistaken as food by animals especially when bags carry food residues. These animals including marine animals experiences pain and distress by choking of these plastic bags in their throat which may also lead to death.
- **Pacific Trash Vortex :**There has been exponential increase in the amount of floating plastics in the world's water bodies. The pacific trash vortex is a maelstrom of marine waste in the North Pacific Ocean. The vortex is marked by very high concentration of drape plastics like plastic bags, plastic bottles and other wastes that have been trapped by currents. It's impact on marine life is cataclysmic due to it's toxic nature.
- **Litter Problem :**Plastic bags are a highly perceptible, ugly component of litter. The plastic consumption is expected to grow to 22 million ton by 2020. If the consumption of plastic bag increases at this rate the littering of environment will increase over time. Though plastic bags are used for short period of time but it takes hundreds of years for it to decompose. Plastic bags can be recycles but only small proportion of them are collected and processed again. The harmful effects of plastic bags is as shown in Fig 1 & Fig 2.

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- **Greenhouse Gases :** On the basis of observation of experiments performed 10 lightweight plastic bags used per week over a two year period, it was found that the impact due to Green House Gas was more than 3 times the impact due to Green House Gas of reusable green bag.

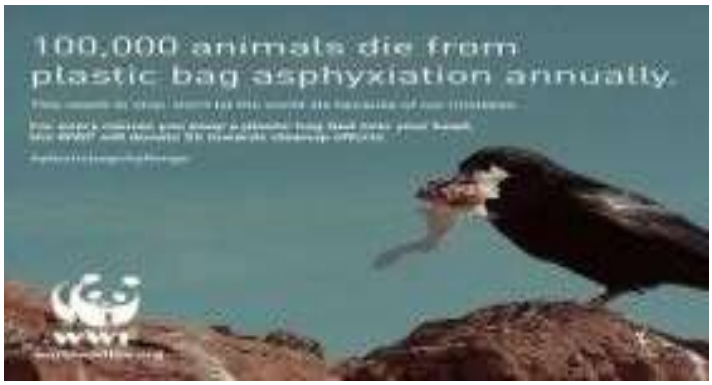

Fig 1: Pathetic state of marine life due to plastic bags

Fig 2: Trivia about plastic usage

RELATEDWORK

It has become challenging for the living life on the earth due to changing global environment. It has become upsetting to see that every country is trying to develop itself without taking consideration the decline of environment like increasing infertility of agriculture lands. More and more industries are being set up which uses harmful chemicals and materials in the production process. Plastic bags, which are pernicious to the environment are being used by the people for their everyday work thereby polluting agriculture lands and water bodies.

Paper bags have conventionally been put forth in this paper as an environmental friendly option as compared to plastic bags. Before the jute bags were introduced, paper bags were most commonly used. The most positive aspect of using paper bags is it's easy recycling process which is now been established by various firms. Scientifically, it has been proven that there are no harmful effects of paper bags as that are of plastic bags.

Available alternative to plastic bags:

1. **Jute Bags** :
   These are bio-degradable bags made from fibre obtained from plant and the fibre is called Jute. Such bags are usually used for storing and holding of groceries. Large jute bags which are also called sacks are used for packaging agricultural commodities.
2. **Bio-degradable Plastic Bags:**
   These are considered as an alternative to the harmful traditional plastic bags. These provides the same advantages that the jute bags provides. Thus the usage of non bio-degradable plastic bag has to be reduced. This increases the market potential for Bio-degradable bags while decreasing the use of conventional plastic bags. There also some disadvantages associate with the use of bio-degradable plastic bags.

3. **PaperBags:**
   Paper bags have conventionally been put forth in this paper as an environmental friendly option as compared to plastic bags. Before the jute bags were introduced, paper bags were most commonly used. The most positive aspect of using paper bags is it's easy recycling process which is now been established by various firms. Scientifically, it has been proven that there are no harmful effects of paper bags as that are of plastic bags.

B] A New Approach to Architectural Logic and Structural Design.

Our state of curiosity lies in the question that how does an architect integrate a sheet of paper and a digital system. A sheet of paper is a 2D system on which an architect carries out his creative drawing process. However, if the paper is fold it becomes possible for the architect to further manipulate and even creates space. By digital system, to put in a more concise way, it uses electronic technology to manage store and process information enhancing the work of a user.

C] Paper Bag Machines:

Marget E. Knight residing in America built a prototype for gluing and folding the paper bags . He was the scientists who created flat bottomed brown paper bags which is readily available in the market . The use of this brown bags increased with the coarse. A patent for paper bag machine was given on June 12, 1883 . In this year after the patent , he introduced his first flat paper bag making machine in the market. This paper bags had numerous qualities i.e they can be easily stored and stacked due to its pleated sides. This bag can also stand by itself without any support. The process for producing bags initially involved two stage production mechanism, which was generally used for bags who had their bottoms as a square. The inclusion of 2 suctions which has drilled surfaces, and then in this ends the paper tube are inserted.

The V- bottom bags are formed with the help of series of processes they are as given:

1. Continuous supply of paper was essential , so the paper roll was crammed into the roller
2. The paper then would be folded , when it is passed through the formed shape
3. After the folding process , glue application would take place
4. Blades would then continuously cut the paper after the application of glue.
5. The end part of the paper is again glued and it would pressed with the help of the rollers which would form the bag
6. This process was a complete automated process , 100 bags/ min was the speed of this machine
7. The cost of this machines ranged from 5-7 lakhs also considering the paper rolls

D) Design of low cost paper folding and gluing machine

The present need was to fabricate a low cost machine which would be used for folding, gluing and making paper bags at a greater speed.

The machine has a pack of detectors i.e accuracy detector, preconfigured counting systems, jam detection system. It uses two papers and folds them into the letter. A remote controlled system is used to carry out the process of gathering, stamping and folding. Every other single process machine of paper gathering and folding machines are too costly, on top of it stamping mechanism is not found in existing machines. This machine has many advantages over the conventional machine they are:

1) Cost for setting up the process is low.
2) This machine is portable
3) Machine is capable of working itself without any human interference
4) Materials selected are durable and the machine is less of severance
5) Sensor selected are common and inexpensive
6) Remote control used which is used is again effective and cost friendly

Design of packaging machine

As Chinese factories had a continuous demand for increasing the packaging speed and also decreasing the cost , a system was introduced which was able to fold and load the boxes with the paper clips . Linkage based technique was used for making the process simple. Graphical and analytical methods were used to check the failure in the mechanism. Computer software were also used for checking the modes of failure for every mechanism. The failures are:

1) There are chances of falling of paper out of the linkage, except the friction is high enough between the box and linkage.

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2) Accurate incrassation is required between step motors for the coordination of the hooks and the slider crank mechanism for proper functioning of the machine.

METHODOLOGY

We get paper pouch as an output when the input to the machine is paper of type mentioned earlier. This machine mainly consist of components like Mild Steel Frame, Conveyor belt, folding mechanism and electronics circuit.
Paper is inserted in the machine which will pass tothe folding mechanism by using belt andconveyor.
Lead screw mechanism is used in the system to apply glue on the paper.
Three motors are used in the system which are used to operate conveyor, lead screw and folding mechanism.

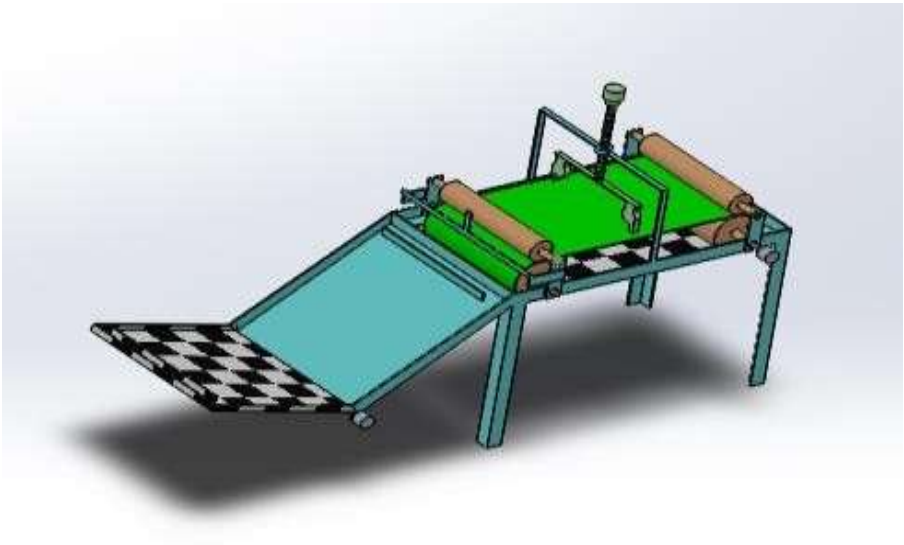

Fig 3: Paper bag making machine.

MACHINEDESIGN

The design of the system was created using Solidworks 14.The draft sheet of the entire assembly is as shown in Fig.4.

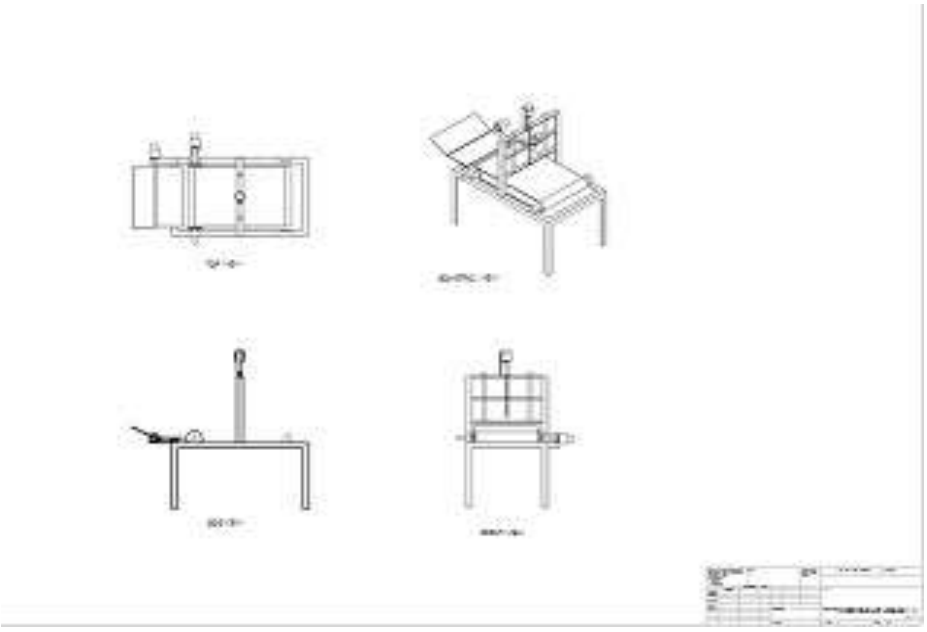

Fig 4: Draft Sheet of Final Assembly.

MACHINE COMPONENTS

Sr.no	Components	Number of Material
1.	Stopper(2)	3
2.	Motor(3)	1
3.	Pritt glue	1
4.	Conveyor	1
5.	Roller	2
6.	Stud	2
7.	**Frame**	1
8.	**Fabrication**	1

Electrical Specifications:

Item	Description
DC Wiper Motor	17 watt
Rpm of Motor	600 m
Input Torque of Gear Box	270.56 N-mm
Output Torque of Gear Box	5952.91 N-mm
DC Motor for Lead Screw and Folding Mechanism	30 RPM/12 V DC

Mechanical Specifications:

Item	Description
Ball Bearing	P204
Belt Material	Polyurethane (PU)
Belt Thickness	15 mm
Conveyor Roller Length	285mm
Conveyor Roller Diameter	50 mm

COSTANALYSIS

The actual cost of the system is as shown in Table

Sr.no	Contents	Cost in INR
1.	Stopper(2)	400
2.	Motor(3)	2500
3.	Pritt glue	300
4.	Conveyor	1500
5.	Roller	400
6.	Stud	200
7.	Frame	1000
8.	Fabrication	3000
9.	Assembly	3000
10.	Other	1200
11.	Total	13500/-

CONCLUSION

We have designed and developed a Paper bag machine by integrating various objectives together. Limitations of the earlier used systems have been compensated in our design which is more robust, efficient and feasible.

Objectives accomplished:

- Main purpose of this study was to eliminate human intervention in the process of making paper bags which reduces man power, makes the process more efficient, and improve the quality of the product.
- Parts which are easily available are used in this system.
- This machine is easy to operate and cost effective as compared to the all current available machines in the market.

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