A PROJECT REPORT

ON

"DESIGN AND FABRICATION OF LOW COST PAPER BAG MANUFACTURING UNIT"

Submitted by

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In partial fulfillment for the award of the Degree

Of

BACHELOR OF ENGINEERING

IN

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UNDER THE GUIDANCE

Of

PROF. ZAKIR ANSARI

DEPARTMENT OF MECHANICAL ENGINEERING

ANJUMAN-I-ISLAM

KALSEKAR TECHNICAL CAMPUS NEW PANVEL,

NAVI MUMBAI – 410206

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ANJUMAN-I-ISLAM

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CERTIFICATE

This is to certify that the project entitled

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To the Kalsekar Technical Campus, New Panvel is a record of bonafide work carried out by him under our supervision and guidance, for partial fulfillment of the requirements for the award of the Degree of Bachelor of Engineering in Mechanical Engineering as prescribed by **University Of Mumbai**, is approved.

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APPROVAL OF DISSERTATION

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Prof. Zakir Ansari _____

Date: _____

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Abstract

Plastic, although considered as one of the greatest inventions by virtue of its use in carrying things but has become a major element in polluting the environment. Plastic bags are known for their carcinogenic gas release after burning in air, for choking of sewage lines during monsoon season and the harmful effect on aquatic life. Government is promoting the use of paper bag to reduce plastic pollution. The project aims at designing a model of paper bag manufacturing unit, which would manufacture paper bags from A4 size educational sheets also commonly known as assignment papers (21.7 X 28.8 cm).

The assignments which each student write during his academic year are used as raw material for our manufacturing unit. The paper bags are designed by taking into consideration it's cost, load carrying capacity and aesthetics. These paper bags have been tested at standard conditions and were found to have enough strength to replace plastic bag of 20 micron (10 X 14 cm).

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. The motive behind doing this project is to manufacture paper bag which are easily disposable, cause no harm to environment and replace the current trend of using plastic bags in India.

Table of Content

List of Figures

List of Tables

Abbreviation and Notations

MT – Metric Ton

VFD – Variable Frequency Drive

DPDT – Double pole double throw

HP – Horse Power

GSM – Grams per square meter

mm – millimeter

kg – kilogram

PVC – Polyvinyl chloride

Chapter 1

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 bio-degradable and hence highly environment friendly than plastic bags, which pose a threat to the environment.Throughout India people make paper

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, meagre 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 ecofriendly, 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.

Chapter 2

Literature Review

Bag making typically has certain main functions which make up of material feeding, sealing, creasing, gluing, drying, cutting, stacking etc. In the Feeding section, roll-fed flexible packaging film is unwound from a feeder roll. Feeder rollers are used to move the film through the machine to carry out the required operations. Feeding is usually an intermittent operation and other operations like sealing and cutting are carried out when feeding has stopped. Dancer systems are used to maintain a constant tension on film web. Feeders and dancers are required for maintaining tension and critical accuracy in feed.

In the Sealing section, temperature controlled sealing elements are brought into contact with the film for a specified amount of time to appropriately seal the material. The sealing temperature and sealing time is dependent on the type of material and they need to be maintained constant for different speeds of the machine. The sealing element configuration and thereby the machine format is dependent on the sealing type dictated by the bag design. In most machine formats, sealing is accompanied by cutting and both of these are carried out only when feeding has come to stop.

In the Cutting and Stacking operations, like sealing are typically done during the non-feeding time of the machine cycle. Similar to sealing, the cutting and stacking also would determine the ideal machine format. In addition to these basic functions additional operations like zipper, hole punch, handle punch, tamper proof seal, spout, cap etc. might be carried out depending on the bag design. Accessories attached to the base machine are used to carry out the additional operations.

2.1 Machine Format

There are many configurations of machines available based on the bag type and end user industry the bags are used in. A few common machine formats are briefly described in the following section.

Fig 2.1 Side Seal

Side Seal: - This is the most common machine type. 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.
The bag bottom is closed due to the folding over operation and the bag top can be left open or closed by zipper or similar attachment. Simple configuration of this type has servos only for the feeders and VFDs for all other axes. It can produce bags upto 500 mm at 200 bags / min. In advanced machines, servos are used for feeders, sealers and stackers which can produce bags upto 300 per minute.

Fig 2.2 Bottom Seal

Bottom Seal: - This type is used typically for long bag lengths upto 2000mm @ 120 bags / minute. Material which is in form of tube (two layers) is fed from the unwinder. The material is fed by using either one or two sets of servo driven feeders. A main mechanical cam driven by induction motor will actuate the seal head, flying knife and stacker. The flying knife consists of a blade which is attached to a belt and when the belt rotates the blade cuts the material. The tube gets sealed and a cut is made below the seal, so that a tube with bottom closed is formed and hence the name bottom seal machine. In higher speed types of bottom seal two servo feeders and servo driven Flying cutter is used to achieve 180 bags / minute

Fig 2.3 Pouch

Pouch: - Machines that produce pouches are the most versatile and sophisticated bag making machines. They are fed upto four layers of material from independent unwinders to produce stand up pouches. These machines typically have two to three sets of servo driven feeders. Cross sealers and side sealers are used to seal up to four sides of the bag. In simple machines the top part of all the sealers is moved by a single induction motor while the bottom part of sealers are stationary. In sophisticated designs the top and bottom parts of the sealers are moved against each other by a servo motor. It can produce pouches at 200 bags / minute.

Fig 2.4 Bag on Roll

Bag on Roll: - This is a type of continuous motion bag maker. The material from the unwinder is folded and sent through rotating sealing heads. Unlike other types of bag makers, here the feeding is not stopped during the sealing stage. Seal heads might have special knives to perforate the bags during sealing. The output is now wound back to form rolls. The simplest form utilizes one VFD to rotate the rotary sealers while all other operations are achieved by pneumatic means.[4]

2.2 General Manufacturing Process

The required raw material is in the form of roll, the cutting of roll is done through the automatic paper bag machine according to the size, and then pressing of required size is done through stereo pressing machine with the help of gum and chemical. Then side grinding of paper bag is done. Then the process

of printing is done and after that punching of holes is done and after that string is tied in these holes and at last they are tested for bursting pressure and packing is done.

MANUFACTURING PROCESS

Raw Material (Paper Roll)

↓

Cutting through Automatic Machine

↓

Stereo pressing with the help of gum and chemical

↓

Paper grinding

↓

Printing through ink

↓

Punching

↓

Testing

↓

Packing

2.3 Current Paper Bag Manufacturing Machines

According to the survey of various reports made, the following data was obtained which is as mentioned below:

2.3.1 A report of Paper Carry Bag Industry

Production Target:

i. Quantity : 15,00,000 Nos. Annually

ii. Sale Value : ₹ 45.00 lakhs

Table 2.1 Material Charges

Sr. No	Particulars	Quantity	Rate	Value (₹ Lakhs)
1.	Paper in roll	1,00,000 Kg.	₹ 30/kg	30.00
2.	Gum	300 Kg.	₹ 25/kg	0.08
3.	Printing Ink	100 Kg.	₹ 200/kg	0.20
4.	Eyelet	750 Pkt.	₹ 50/Pkt.	0.38
5.	Lace	75 Kg.	₹ 100/kg	0.07
			Total	**30.73**

Fig 2.5 Automatic Paper bag making machine

Process:

The major process steps are:

i. Cutting paper into proper size by cutting machine.
ii. Printing the paper as per need.
iii. Making bags by automatic bag making machine by folding, pasting, & shearing.
iv. Punching.
v. Eyelet fitting.
vi. Lace fitting.

Machinery:

The major machineries & equipment required are –

i. Automatic paper bag making machine.
ii. Creasing machine.
iii. Cutting machine.
iv. Misc. tools and equipment's.[1]

Table 2.2 Sales of Paper Bag Annually

Sr. No	Particulars	Quantity	Rate (₹)	Value (₹. Lakhs)
1.	Paper Carry Bags	15,00,000	3/-	45.00
TOTAL			**45.00**	

2.3.2 Report by Mech. Division, MSME Development Institute, Solan (HP)

Production Capacity:

i. Quantity : 150 Metric Ton

ii. Sales Value : ₹ 45 Lakh

Table 2.3 Raw Materials and Direct Consumables (per month):

Sr. No	Description	Quantity	Rate (₹)	Amount (₹ in lakhs)
1.	Recycled Kraft Paper of 60 GSM and 40 GSM Assorted size(width)	12.5 MT	22,000/MT	2.75
2.	Glue suitable for Kraft Paper envelops	250 kg	15/kg	0.03750
TOTAL				**2.78750**

Bag Formation Process:

The required size of the bag is obtained by fixing the exact size plate for flat or satchel to the size plate holder on the machine and the length to the tube is obtained by changing the size gear wheel, each Tooth of which represents One Centimeter in length. The tube, after being cut by the beater into exact size as per the size gear, is carried forward by means of conveyor rollers to the delivery cylinder. The delivery cylinder at the bottom folds the bag. It is pasted and the bag is carried by the folding cylinder to the delivery table. The bag is then released and delivered in a vertical stack.[3]

Fig 2.6 Square bottom paper bag making machine

2.3.3 Report by Khadi and Village Industry Commission (KVIC), Mumbai

Machinery Used:

Fully automatic Heavy & Special type paper carry Bag forming machine and Accessories like Double color/four color flexo printing unit attachment, 3 HP motor for Main drive,12 Nos . Flat type size forming Dies, 12 nos, Gasset type. Gear Wheel, Stereo design roller and one bag control unit.[2]

Table 2.4 Production Capacity of KVIC

Sr. No	Particulars	Capacity in No.	Rate (₹)	Total Value (₹ in 000)
1.	Paper Carry Bags	2000000	2.76	5523.52
TOTAL			**5523.52**	

Fig 2.7 Brown paper bag manufacturing unit

2.3.4 Conclusion

All the above mentioned report depicts that *recycled paper* is used as a prime raw material. Also it summarized the cost of manufacturing one paper bag and the cost of raw material required annually. The report gave the specification of machine required for the paper bag manufacturing.
For more details refer Appendix

Chapter 3

Problem Definition

Bag making machines produce bags / pouches that are used to pack various types of goods in food and beverage, pharmaceutical and consumer product industries. In general these machines are fully automatic and require operator intervention only to replenish the raw material and remove the finished products. But these machines are costly and they require recycled papers as the raw material. These recycled papers are strengthened by adding chemicals in order to make them bear load in the form of paper bags. However this strengthening of recycled paper by adding chemicals creates a lot of pollution which in turn harms the environment. The major drawbacks of the existing machines are: - too large, occupy huge area, imported, too costly; require many people to operate, need of separate machines for creasing, folding and gluing.

So the current method of manufacturing of paper bag from this recycled paper has above mentioned disadvantage which is the problem statement. This project aims at design and development of compact, low cost paper bag making machine for the mass production of carry bags from assignment papers. The machine will be able to produce paper bags made of assignment papers. The paper bag produced will be

an alternative to a particular category of polythene bags usually used. The machine will be designed considering all the criteria of its realistic paper bag production.

3.1 Market Potential

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. Paper carry bags are common packaging materials being used by the textiles and cloth merchants, dry cleaners, bakers, grocers, stationers, sweet sellers etc. Establishment of shopping complexes and consumer stores in the rural, semi-urban and urban areas, the demand for paper bags has increased. Due to the bio degradability of paper and its origin from nature source, it has got an added advantage in packaging.

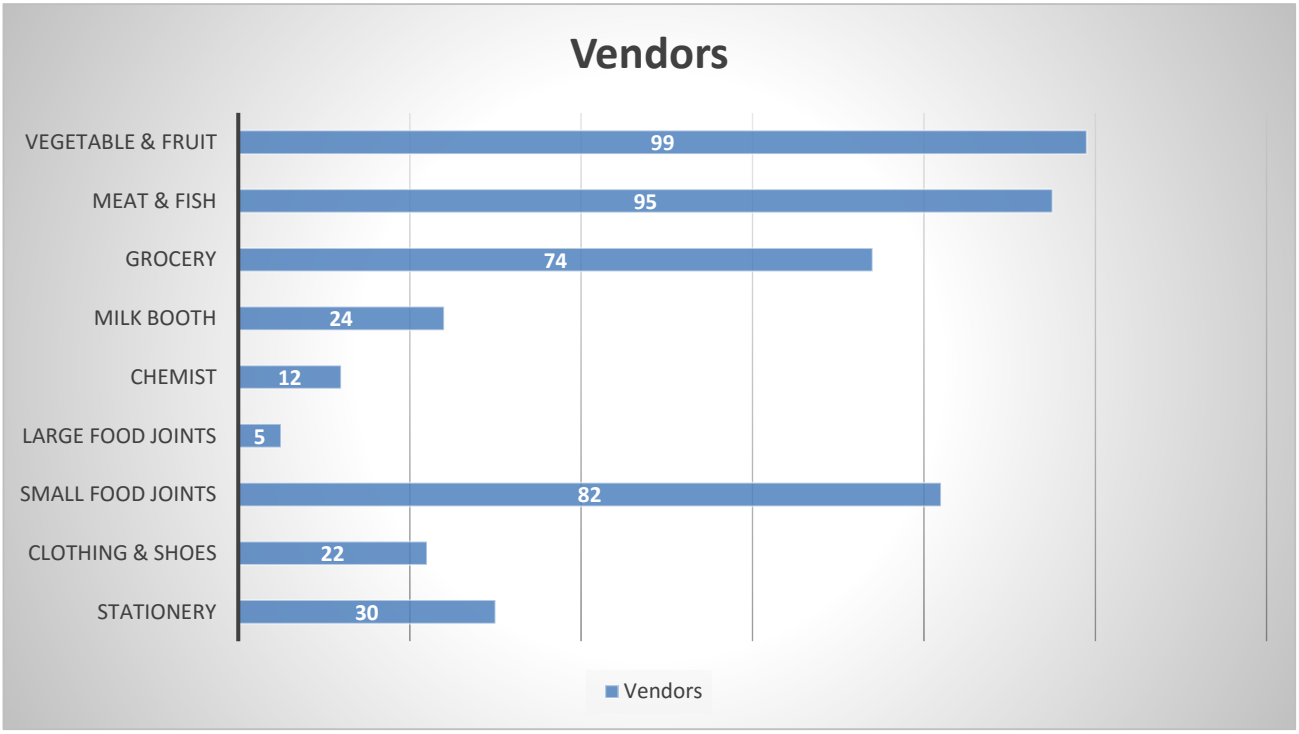

Fig 3.1 Usage of Plastic Carry Bags in Delhi

The figure depicts the percent usage of plastic carry bags out of 100 vendors in Delhi. Nearly 99 % of vegetable and fruit vendors out of 100 use plastic bags, followed 95 % by meat and fish vendors. Thus the above figure clearly indicates the area of application of plastic bags. So the project aims to reduce the use of plastic bag even by some amount from these areas.

Chapter 4

Background Work

In order to reduce plastic pollution, a paper bag was designed. This paper bag was designed taking into consideration its load carrying capacity, aesthetics and eco-friendly touch. The design of paper bag is shown in the figure 4.1. All the dimensions are in mm.

Material Used: - Cotton Lace, Joker Gum and assignment pages.

Procedure for Manufacturing: -

- First a center paper is marked as per dimension shown in figure above.
- Later the paper is pasted with four more papers in such a way that they make a plus-shape.
- This plus after drying is glued and a loop of cotton lace is placed over it and another paper plus is stucked and pasted over it and left for drying.
- After this it is folded and glue is applied on few required area and left for drying.
- Thus the final paper bag is made.

Testing: - The bag once manufactured was subjected to static loading. In static loading the bag was hanged and sand as well as gravels were put in it till it was failed. The weight was noted as the paper bag got failed. This weight was called weight of failure.

Observation: - The results of test showed that the load carrying capacity is 15 kg and above.

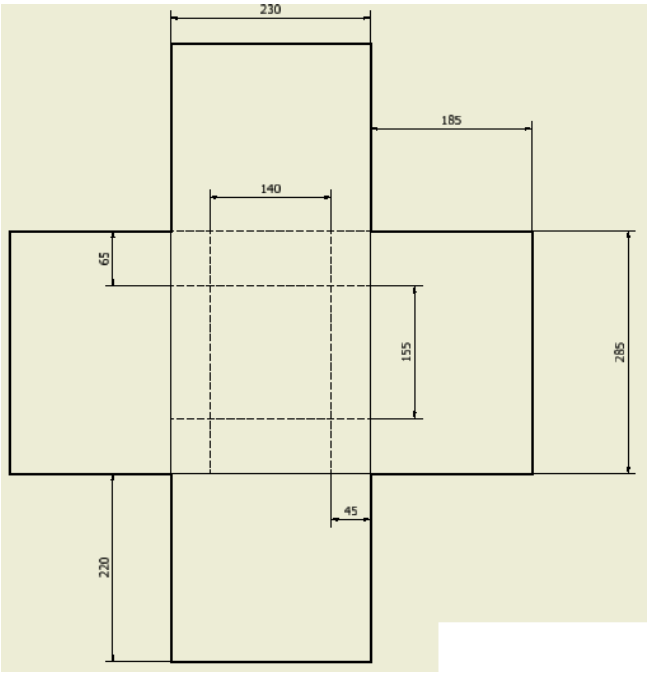

Fig 4.1 Dimensions of Paper Bag

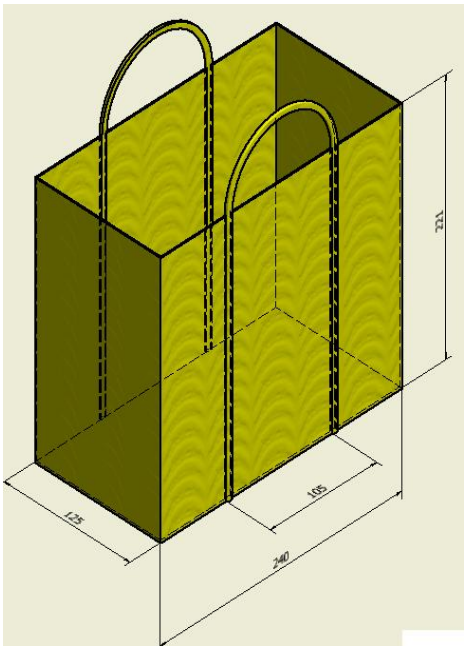

Fig 4.2 Design of paper bag

Chapter 5

Methodology

As discussed above, our initial work involved designing paper bag. This project aimed at manufacturing the paper bag in large quantity. However the paper bag manufacturing unit must be compact, cheaper and should have reduced maintenance than the currently available paper bag manufacturing unit.

The project followed two approach:

- **Primary Approach**: - Primary approach involved designing the complete manufacturing setup on Autodesk Inventor software. The designing of setup was done considering into account its practicality of performing operations.
- **Secondary Approach**: - Secondary approach involved fabricating the designed setup. Fabrication of project was done workstation by workstation. Each workstation had certain

mechanisms which followed certain sequence and transferred the product to next workstation.

5.1 Designing work

- **Literature of design: -** Initial survey of design was done on internet. Also actual visit to the manufacturing plant of paper bag and the construction site for idea regarding the belt conveyor was carried out. This whole thing was then clubbed to the process of designing.
- **Preliminary Design: -** A preliminary design was made which was based on operations to be performed and literature study. This design was later been validated by our guide considering all the parameters. Each workstation had some mechanisms. These mechanisms were designed after intense thinking and a number of group discussions.
- **Improvements in design: -** The design which was made in preliminary stage went through certain changes when fabrication process was carried out. Due to some technical reasons the component which was fabricated was changed and in turn there was a change in the design.
- **Finalized Design: -** The manufacturing setup thus went through some changes in its design. And the final setup was made as per the design.

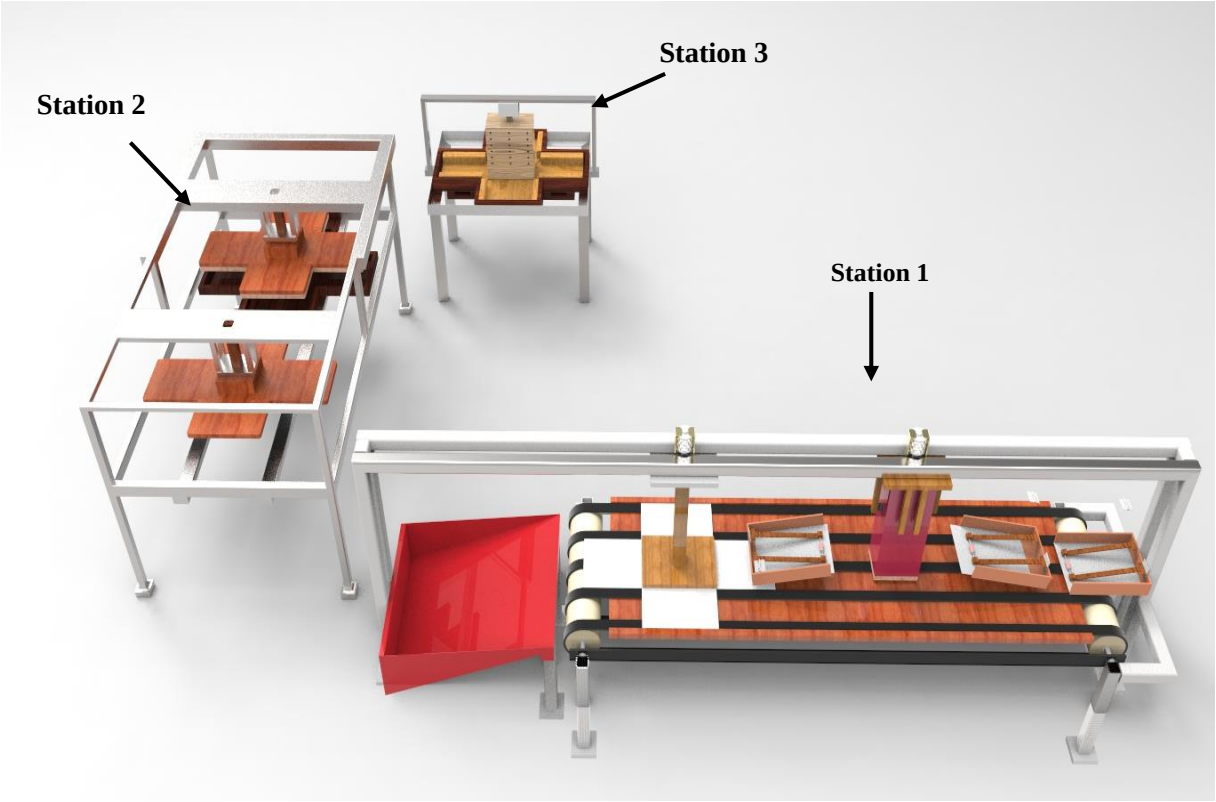

Fig 5.1 Complete Designed Setup

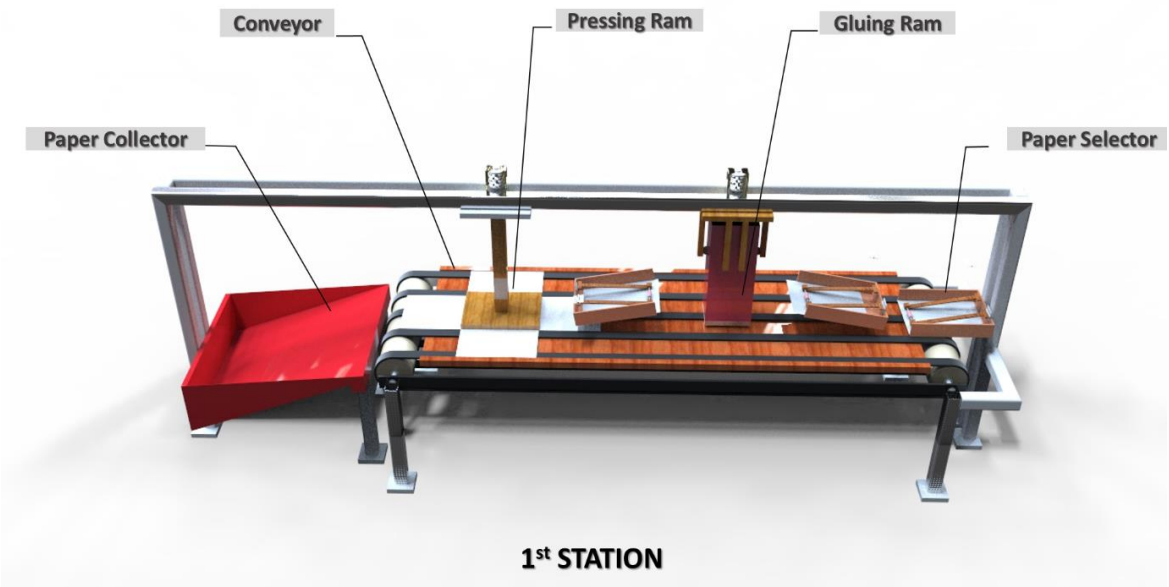

Fig 5.2 Workstation 1

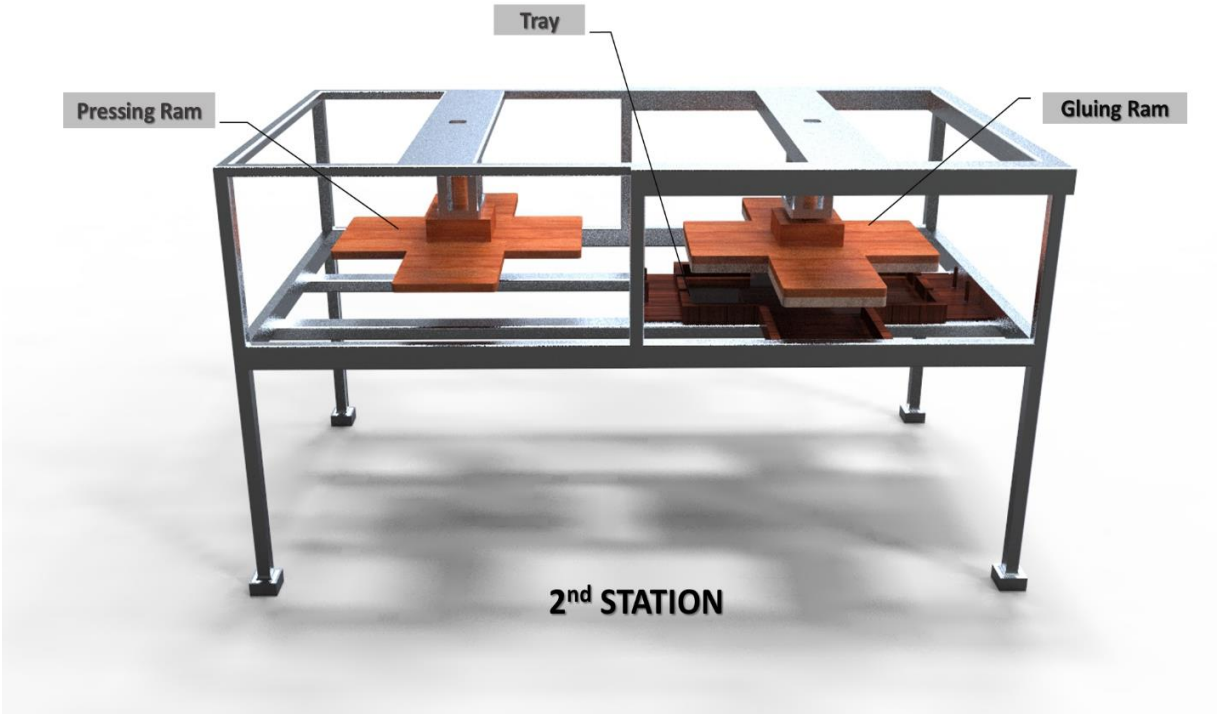

Fig 5.3 Workstation 2

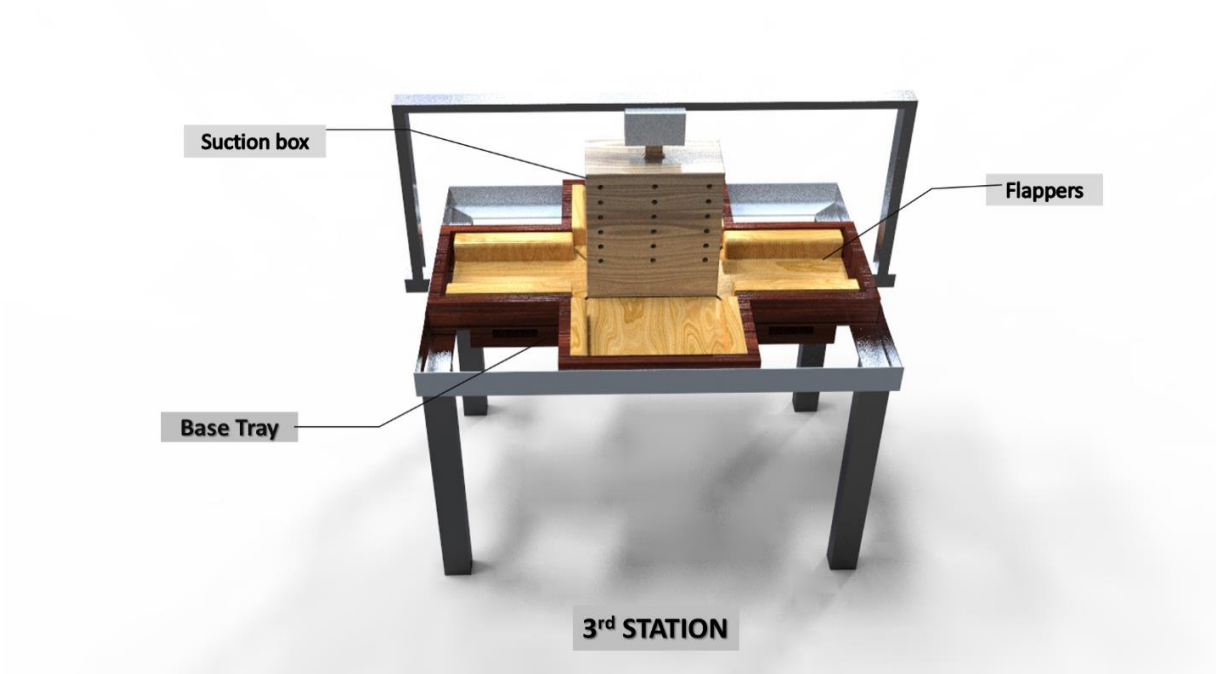

Fig 5.4 Workstation 3

5.2 Mechanism Developed

The complete manufacturing setup having various workstation have been self-designed. These workstation were made to facilitate portability and replacing if needed maintenance with other workstation. **Different Mechanisms incorporated in paper bag manufacturing unit: -**

- **Printer Mechanism**: **-**
  The idea behind using this mechanism came from actual printer. As the printer takes only one paper at a time for printing from stack of papers, we needed the same mechanism in our setup. So we named this mechanism as printer mechanism.

  Construction: - A rectangular wooden frame is made which will hold the stack of assignment papers. A gear linkage between motor and shaft is made so that motion from motor is transmitted to shaft with ease. The arduino board is connected to battery and motor.

  Working: - A shaft attached with rubber pickup rests on the top of the stack of assignment papers. On getting the signal from the arduino board, the motor rotates and in turn the shaft carrying rubber pickup rotates. This results in sliding motion of papers in forward direction due to friction between rubber and paper. The coefficient of friction between rubber and paper is more as compared to coefficient of friction between paper and paper. Therefore it will result in movement of one paper at a time. There is a provision of two rollers made, which will guide the paper all the way ahead to the conveyor belt. Complete detailed drawing is explained in Appendix

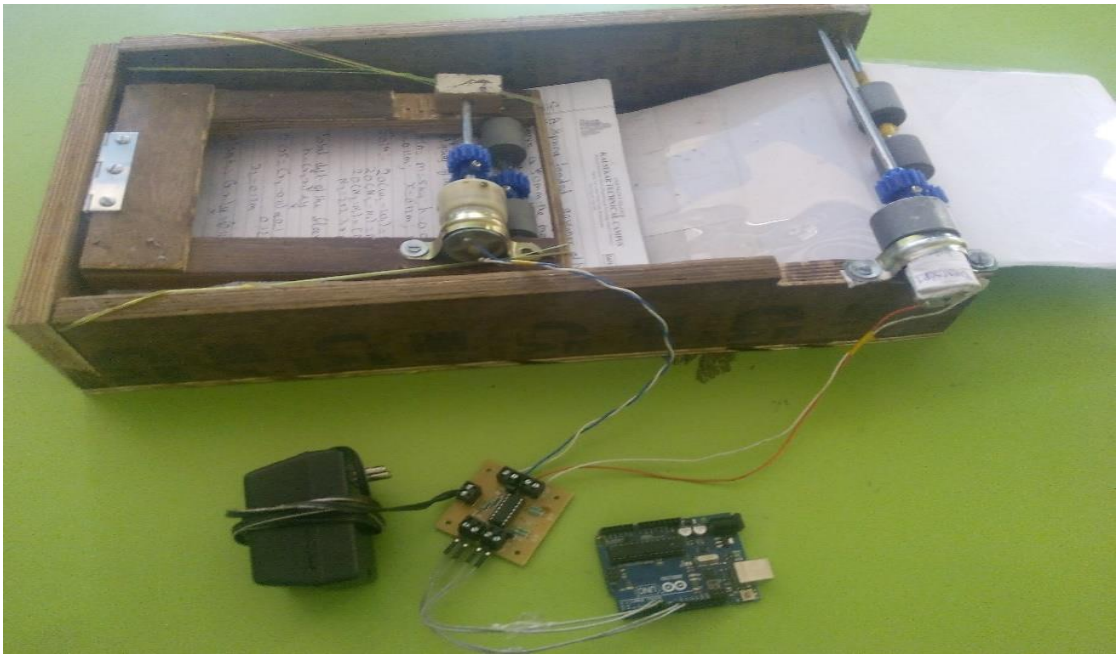

Fig 5.5 Printer Mechanism

- **Conveyor Belt Mechanism: -** The machine involved transfer of paper from each workstation. So belt conveyor was selected for this work.

  Construction: - Frame with dead troughing rollers in middle section and head-up rollers at two ends. The PVC pipes are used as rollers. One of the head-up roller is connected to a prime mover via coupling which is controlled by DPDT switch. Rexine is used as belt for the conveying purpose.

  Working: - The belt of belt conveyor comes into action when the DPDT switch is pressed. This conveyor can be moved in forward or reverse direction as needed.

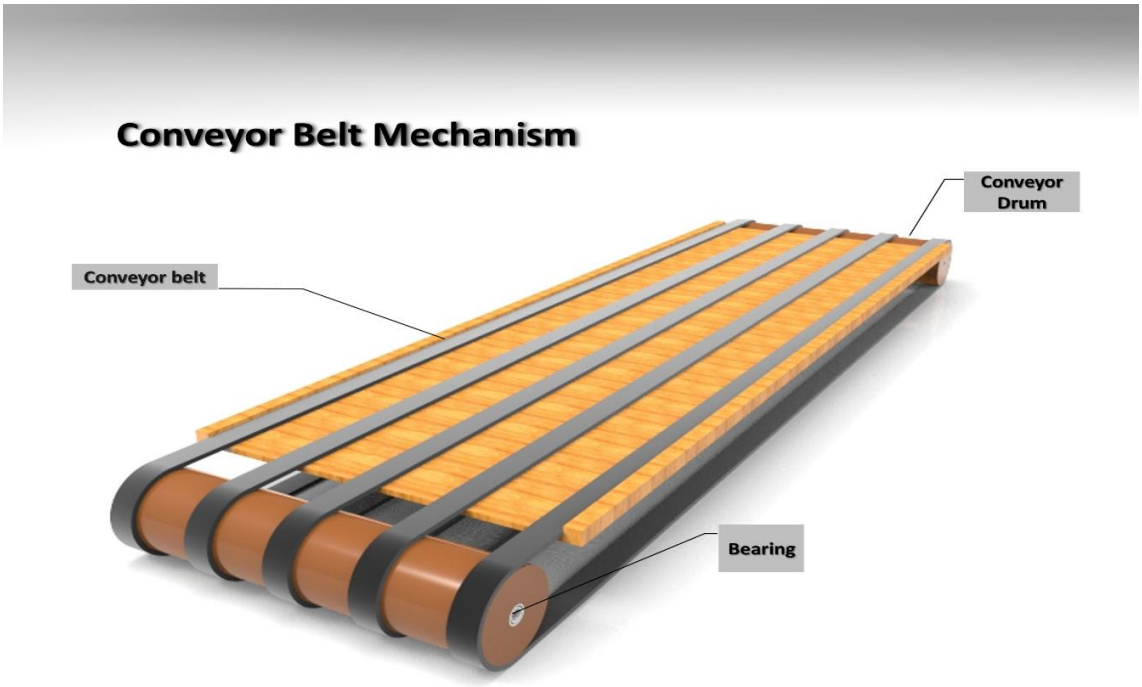

Fig 5.6 Belt Conveyor

- **Gluing Mechanism**: -

  Construction: - This mechanism consists of wooden rectangular box open from upper face operated through lead screw and motor, sponge fitted over the bottom surface of rectangular box, hole drilled in the bottom wooden surface.

  Working: - In this mechanism the bottom surface of the wooden rectangular box places itself on the paper where it has to be glued. The vertical traverse of the wooden ram is controlled by DPDT switch. The glue passes from the sponge through holes drilled to the area of application on paper. The ram since controlled by DPDT switch can be traversed back vertically upward.

- **Pressing Mechanism: -** In order to press the glued surface evenly, this pressing mechanism was developed.

  Construction**:** - This mechanism consists of a wooden ply operated with lead screw and motor.

Working: - As the glued part on paper comes in this pressing area, the wooden ply which is DPDT switch operated moves vertically downward and exerts high pressure due to high torque motor fitted over it.

Fig 5.7 Gluing Mechanism

Fig 5.8 Pressing Mechanism

- **Sandwiching workstation: -** This mechanism is for making a layer of two paper plus sandwiched with a cotton lace inside it, thus it is termed by us as sandwiching workstation.

Construction: - It includes wooden plus shaped tray with grooves made over its web area. And it incorporates gluing and pressing mechanism.

Working: - At this workstation, the initially formed paper plus is glued fully by gluing mechanism controlled by DPDT switch and in this glued surface a loop of cotton lace is placed through grooves cut on the web area. Later another paper plus is placed in the tray and the further pressing mechanism is carried out.

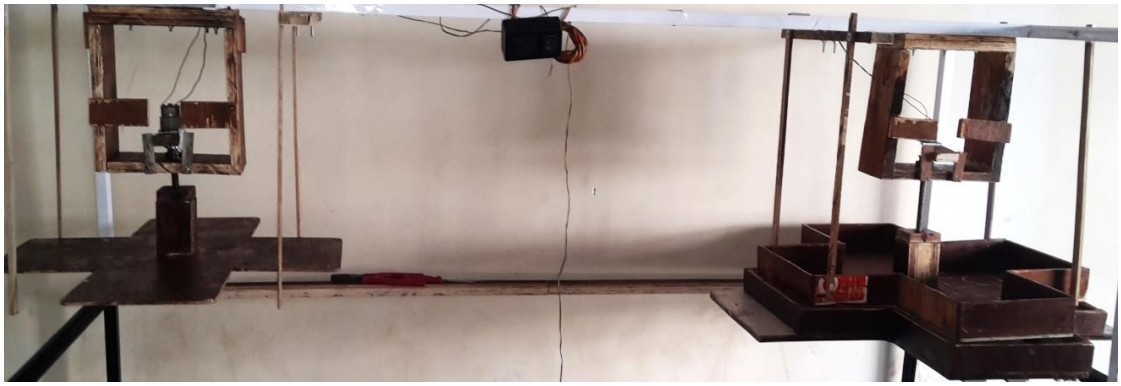

Fig 5.9 Sandwiching Workstation

- **Folding Workstation**: - In order to automate the folding work of paper bag, this mechanism was developed.

  Construction: - It includes a wooden tray in shape of plus with a compressor fitted in the middle portion of the tray. A compressor is enclosed inside the wooden box with small holes drilled on its walls. Four wooden ply called as flaps are hinged to the sides of the central wooden box. Below figure clearly shows the construction of this workstation.

  Working: - The sandwiched paper as formed in sandwiching workstation is placed in this workstations wooden tray, the flaps which are DPDT switch operated rotates about its hinged axis. The compressor simultaneously starts and it holds the paper surface area from falling down.

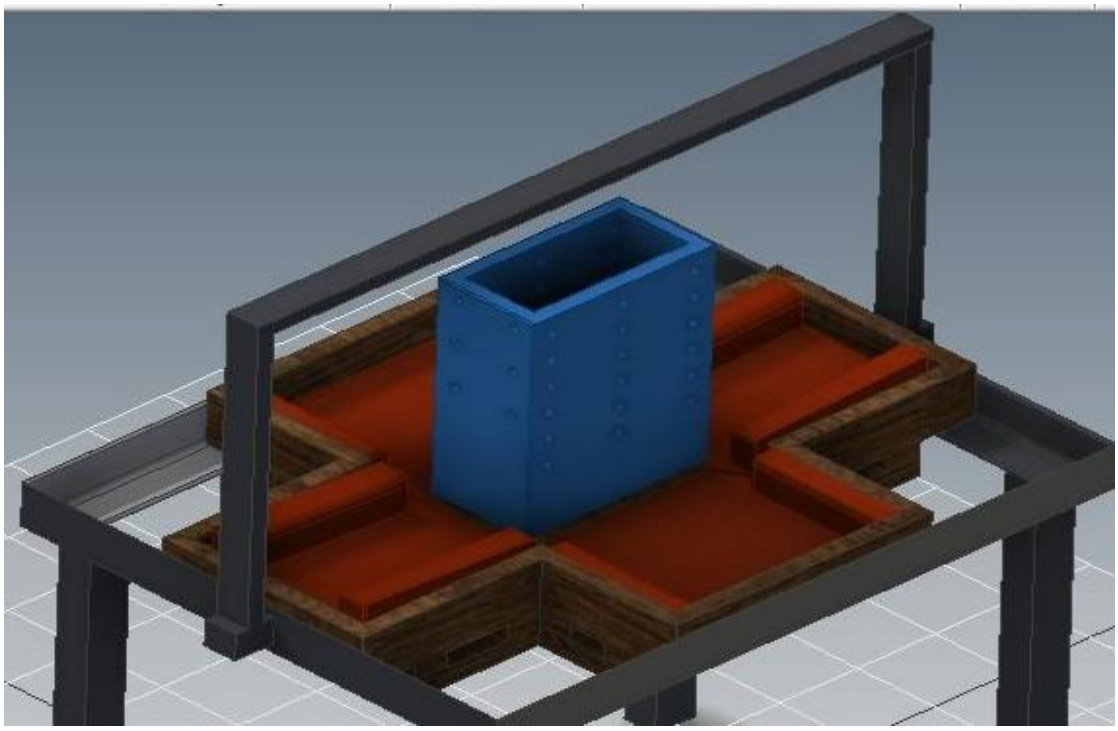

Fig 5.10 Position of flaps before folding

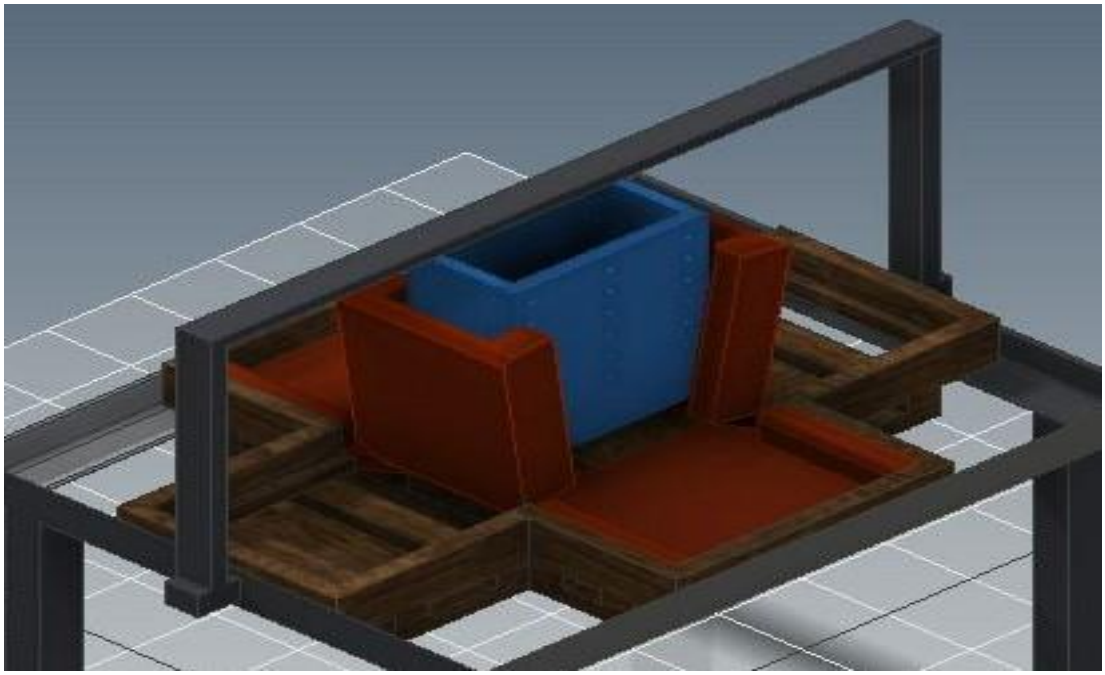

Fig 5.11 Position of flaps during folding

5.3 Flow of work

The complete explanation in the form of block diagram is shown below. The complete flow of paper from start to the final bag production takes place in the three workstation discussed below.

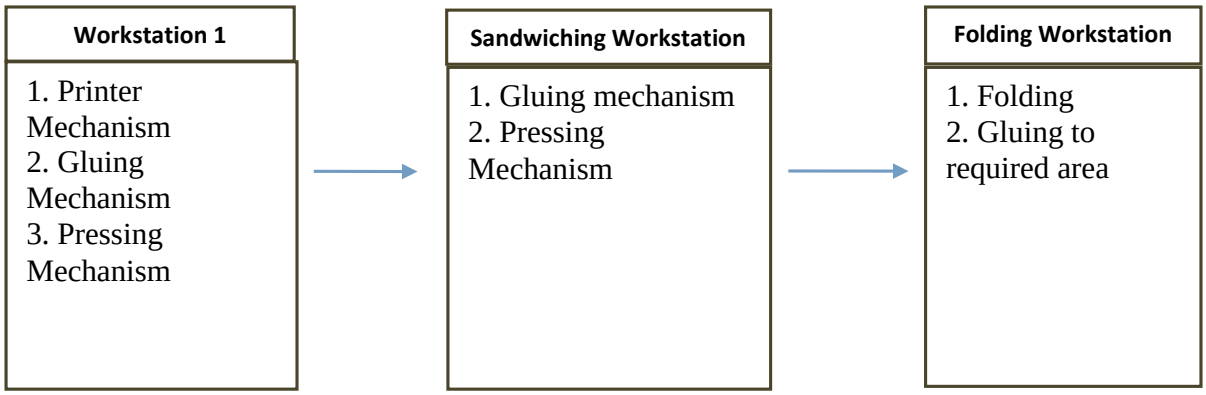

Fig 5.12 Work flow

5.4 Working of setup

The working of the setup is as explained in detailed way below:

- The assignment papers in first workstation is feed through *printer mechanism.* This paper later travels through the belt conveyor to the *gluing mechanism*.
- Here the gluing of sides of center paper takes place.
- Further the paper is feed from printer mechanism to the four sides of this glued part and this plus formed is moved further to the *pressing mechanism* for even pressing. Thus a paper plus is formed.
- This paper plus then moves second workstation called *sandwiching workstation*. Here one paper plus is glued by gluing mechanism, and a loop of cotton lace is placed over it and further another paper plus is placed over it, to form a sandwich of paper-lace-paper.
- This sandwiched paper profile is then sent to *folding workstation*, where the folding of paper is done to give the final shape of paper bag. Some manual gluing is done over the place required.

- Later the bag is left for drying
- Finally the packing of paper bag produced is carried out.

5.5 Tools and Equipments used

- Hammer
- Pallets
- Smooth File
- Rough File
- Square File
- Pipe Saw
- Wood Saw
- Chisel
- Screw Driver set
- Measuring Tape
- Plier
- Sheet Metal Cutter
- Scissor
- Wrench
- Try Square
- Wood Cutting Machine
- Hand Grinding Machine
- Welding Machine
- Drilling Machine

Fig 5.13 Tool Box

5.6 Operations Performed

During the course of project, various operations were performed by each of our group members. Those operations are named below.

- Grinding Operation

Fig 5.14 Grinding Operation

- Welding Operation

Fig 5.15 Welding Operation

- Drilling Operation

Fig 5.16 Drilling Operation

- Wood cutting operation

Fig 5.17 Wood cutting Operation

- Metal cutting operation

Fig 5.18 Metal cutting operation

- Designing Operation

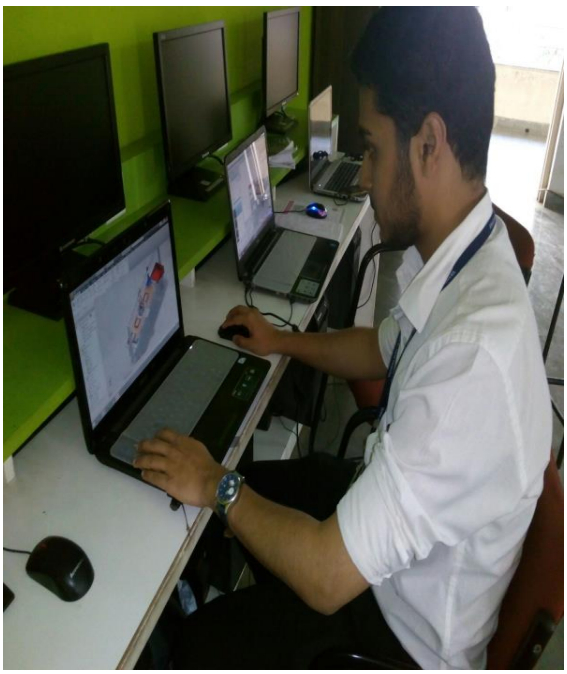

Fig 5.19 Designing Operation

5.7 Dimension Table

Table 5.1 Dimensions of Setup

Sr.No.	Station	Dimension (cm) L X B H
1	STATION 1	255.5 X 86 X 152
2	STATION 2	187 X 81.5 X 139.5
3	STATION 3	81.5 X 67.5 X 106

5.8 Machine Assembly

Fig 5.20 Complete Fabricated Setup

Chapter 6

Project Costing

Table 6.1 Cost Sheet

Sr No.	Material	Quantity	Total cost (₹)
1	Puppy Gum	2	70
2	Araldite	3	135
3	M-Seal	4	80
4	Fevi Bond	2	90
5	Adaptor	3	400
6	Polish Paper	5	50
7	Wood Ply	6*3 (4 sheet)	2320
8	Nails And Screws	As Per Req.	100
9	Paper Pick Up	60	500
10	Shaft	6ft (2 Piece)	900
11	Clamp	12	24
12	Nut And Bolt	1 Box	150
13	Washer	120 Piece	40
14	Cotton Lace	50 Grams	30
15	Flange	5	125
16	Idler Roller	2	170

17	Hinges	10	80
18	Bearings (Axial)	4	220
19	Bearings (Radial)	4	136
20	Fevicol	2	160
21	Motor (100 Rpm)	5	1250
22	Motor (250 Rpm)	5	1500
23	Motor (1000 Rpm)	5	2250
24	Wires	25	100
25	Acme Lead Screw	5	100
26	Square Pipe	20.3 Kg	934
27	Angle Pipe	33 Kg	1254
28	Wood	5	500
29	Drill Bit	4	160
30	Varnish	1	120
31	Paint	1	150
32	Thinner	1	60
33	DPDT Switch	2	50
34	PVC Pipe	5.5 Ft	900
35	Castor Wheel	12	96
36	Bracket	1 Pair	70
37	Marker	6	72
38	Steel Ruler	2	40
39	Pulley	4	100
40	Wood Polisher	4	120
41	Metal Cutter	4	200
42	Electrode	1 Box	200
Total :- Sixteen thousand two hundred and fifty only			**16,250=00**

Chapter 7

Conclusion

After working over our final year project we came across following conclusion:

- Plastic bags which harm our environment, aquatic life and human health and moreover are not degradable have paper bag as an alternative. We designed a paper bag which will not only be eco-friendly and degradable, but also will have high load carrying capacity, and nice aesthetics.
- Assignment papers which are a waste from educational institutions will be used as a raw material for manufacturing paper bag of our design.
- A manufacturing setup for producing our designed paper bag was designed and fabricated.
- This fabricated setup used waste assignment papers as raw material due to which its raw material cost got reduced.
- This machine is cheaper, compact and portable than currently available paper bag manufacturing unit.

Chapter 8

Future Scope

Considering the present position and working of setup, some changes in its present state would be done in future. The future scope of this project is mentioned below:

- The current automation of belt conveyor and other mechanism is by DPDT switch, this could be changed to micro-controller and arduino programming operated.
- The positioning of paper at right position could be achieved by installing light sensors.
- Currently only assignment papers are used as raw material for making paper bag. However it could be made flexible as to take newspaper and other waste papers as raw material.

References

BOOKS

1. *Paper made carry bag, A project profile report.*
2. *khadi and village industry commission, Project profile on paper carry bag*
3. *Paper carry bags, Mech. Division, MSME Development Institute, SOLAN (HP)*
4. *Bag making machine, Allen Bradley, Rockwell Automation.*

Appendix I

```
int switchM=0,switchA=0,switchB=0,sensorA=0,sensorB=0,sensorO=0,part=1;
void setup()
{
	 pinMode(2,OUTPUT);
	pinMode(3,OUTPUT);
	pinMode(4,OUTPUT);
	pinMode(5,OUTPUT);
	pinMode(6,OUTPUT);
	pinMode(7,OUTPUT);
	pinMode(8,INPUT);
	pinMode(9,INPUT);
	pinMode(10,INPUT);
	pinMode(11,INPUT);
	pinMode(12,INPUT);
	pinMode(13,INPUT);
}
void loop()
{
	switchM=digitalRead(8);
	while(switchM==0);
	{
		digitalWrite(2,0);
		digitalWrite(3,0);
		digitalWrite(4,0);
		digitalWrite(3,0);
		digitalWrite(5,0);
		digitalWrite(6,0);
	}
	if(switchM==1)
	{
		part=1;
		if(part=1)
		{
			while(switchM==1)
			{
				sensorA=digitalRead(10);
				while(sensorA==0)
				{
					digitalWrite(2,1);
```

```
                digitalWrite(3,0);
            }
            sensorA=digitalRead(10);
            switchA=digitalRead(11);
            if(sensorA==1)
            {
                digitalWrite(3,0);
                while(switchA!=1)
                {
                    digitalWrite(2,0);
                    digitalWrite(3,0);
                    digitalWrite(4,1);
                    digitalWrite(5,0);
                }
            }
            switchA=digitalRead(11);
            if(switchA==1)
            {
                digitalWrite(4,0);
                digitalWrite(5,1);
                delay(3000);
            }
             sensorO=digitalRead(9);
            while(sensorO==0)
            {
                digitalWrite(2,0);
                digitalWrite(3,1);
            }
            if(sensorO==1)
            {
                digitalWrite(2,0);
                 digitalWrite(3,0);
                 switchM==0;
                part++;
            }
        }

}
switchM=digitalRead(8);
while(switchM==0);
{
        digitalWrite(2,0);
        digitalWrite(3,0);
        digitalWrite(4,0);
        digitalWrite(3,0);
        digitalWrite(5,0);
        digitalWrite(6,0);
}
if(switchM==1)
```

```
	{
		if(part==2)
		{
			while(switchM==1)
			{
				sensorB=digitalRead(12);
				while(sensorB==0)
				{
					digitalWrite(2,0);
					digitalWrite(3,1);
				}
				sensorB=digitalRead(10);
				switchB=digitalRead(11);
				if(sensorB==1)
				{
					while(switchB!=1)
					{
						digitalWrite(2,0);
						digitalWrite(3,0);
						digitalWrite(6,1);
						digitalWrite(7,0);
					}
				}
				switchB=digitalRead(13);
				if(switchB==1)
				{
					digitalWrite(6,0);
					digitalWrite(7,1);
					delay(3000);
				}
				sensorO=digitalRead(9);
				while(sensorO==0)
				{
					digitalWrite(2,1);
					digitalWrite(3,0);
				}
				if(sensorO==1)
				{
					digitalWrite(2,0);
					digitalWrite(3,0);
					switchM==0;
				}

			}
		}
	}
}
```