iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** IV **Month of publication:** April 2019

DOI: https://doi.org/10.22214/ijraset.2019.4596

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 7 Issue IV, Apr 2019- Available at www.ijraset.com

Low Cost Automated Paper Bag Making Machine

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Abstract: 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 manufacture than paper bags, cloth or other eco-friendly bags. In this paper 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 microcontroller,TR sensors and DC motors which kept the cost of the system significantly low as comparable to PLC based design and have automated the manufacturing process.

Keywords: Microcontroller, CATIA V5, CAD, IR sensors, paper bag machine.

I. INTRODUCTION

We need small size bags every day for various purposes like grocery, fruits, and vegetables. We use plastic bags for such purposes [1]. 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 [2]. So to avoid above harmful effects of Plastic Bags, viable alternative is required which is Paper Bag. Actually, Paper Bag is being used but in very small scale. Conventional Paper Bags require special paper which increases the overall cost of the Paper Bag. All these problems are eliminated in the presented machine [3]. A machine whose initial cost is less, which does not require any special paper, which can be used for small scale production, is developed [4]. This machine will help a poor family to earn money through small scale production of paper bags. The paper bag will be produced from the regular size newspaper to reduce the cost of the bag [5].

Paper bags have traditionally been presented as the environment friendlier option when compared to plastic bags. Prior to the introduction of jute bags, paper bags were the most commonly used for shopping purposes [6].The natural fibers of paper, and the renewable resource used has a positive image, as the increase in volume of the paper bags, likely to be sent to the landfill, have now taken over a new role in the recycling options which are firmly established[7] .

II. 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 approaches:

1) Primary Approach: Primary approach involved designing the complete manufacturing setup on CATIA V5 software. The designing of setup was done considering into account its practicality of performing operations
2) Secondary Approach: Secondary approach involved fabricating the designed setup. Complete Fabrication of project was done according to the operations. Each processes had certain mechanisms which followed certain sequence and transferred the product to next process of work.

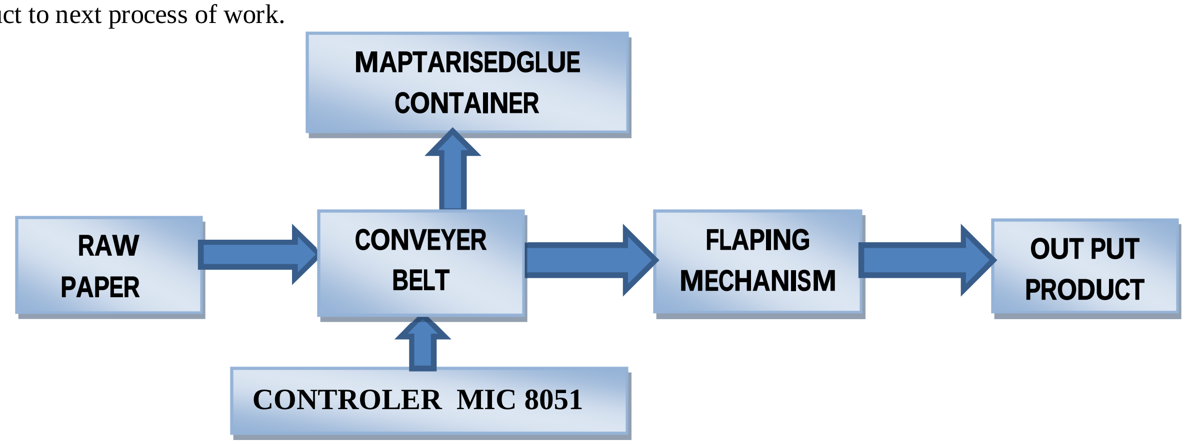

Fig2. Block diagram of working model

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3) Our model works as follows. As per required size paper sheet was cut and bunch of cut paper sheet put on feeding floor. When power supply is on feeding mechanism (pushing motor) starts and push paper on conveyer belt. As paper head comes on conveyer, IR sensor (infrared radiation) detect it and send signal to conveyer motor through controlling circuit. Conveyer starts and paper moves on. When it reaches in gluing area second sensor detected it and send signal to controller and controller send sign to glue motor. Glue motor start upto paper present below it when paper passout it automatically get off. From conveyer paper feed on flapping mechanism and bye pushing it on get actuated and paper gets flapped.

III. DESIGN CALCULATION

A. *Design Of Bearing*

D=20mm , Fa =100 N,

Fr = 250 N , Nd =150 rpm

Proposed bearing SKF

Required life =1000 hours

From table 24.60 for SKF 6204(DATA BOOK)

Basic static load rating capacity C_{or} =7800 N

Basic load rating capacity C_r= 14000 N

Fa/C_{or}=100/7800=0.01282…..(1)

Assume minor shock & bearing works at normal temperature

Kt=1 from table 24.29. For minor shock load application factor Ka=1.5

Therefore Fe =Fr*Ka*Kt =250*1*1.5 =375

Dynamic load rating C_r = Fe $\{(Ld/Lr)\ (Nd/Nr)\}^{1/m}$ …..(2)

Lr = Rated life =500 hours

Nr = Rated speed =33.33 rpm

C_r = 14000 N; m=exponent = 3 for ball bearing

14000 =375$\{(Ld/500)(150/33.33)\}^{1/3}$

$(14000/375)^3$ = (Ld/500) *$(150/33.33)\}^{1/3}$

Therefore Ld = 1605.98 hours

Since designed life is more than the require life, the selected bearing is suitable. Hence the proposed SKF 6204 is suitable for the expected life of 1000 hours.

B. *Design Of Shaft*

1) *Bending:* The material forces that are developed on any cross section of the shaft give rise to stresses at every point. The internal or resisting moment gives rise to so call bending stresses.
2) *Torsion:* When the shaft is twisted by the couple such that the axis of the shaft and the axis of the couple coincides, the shaft is subjected to pure torsion and the stresses at any point of cross section is torsion or shear stresses.
3) *Combined Bending And Torsion:* In practice the shaft in general are subjected to combination of the above two types of stresses. The bending stresses may be due to following

1. Weight of belt
2. Pull of belts
3. Eccentric Mounting
4. Misalignment

The torsion movement on the other hand may be due to direct or indirect twisting. Thus any cross-section of the shaft is subjected simultaneously of both bending stresses and torsion stresses.

We will design the shaft based on the prime mover available with us and the maximum tension

= 2.5 x 9.80= 24.5 N

Torque of shaft = T, where N = 42 rpm

P= 2ΠNT/60 ….(3)

(0.5 x 735) = (2 Π x 42 x T)/ 60

T = 386.25163 N-m ,

T = 386251.63 N-mm

The shaft is subjected to bending moment due to tension. As total load on shaft is 24.525 N

B.M= F x L = 24.5 x 190 = 4655 N – mm…..(4)

The shaft is subjected to twisting moment as well as bending. Twisting moment is constant throughout the shaft but bucking moment is maximum at left point.

Equivalent twisting moment

$‘T’_{Eq} = (M^2 + T^2)^{½}$ …..(5)

$‘T’_{Eq} = ((386251.63)^2 + (4655)^2)$

$= 386279.67$ N – mm

T eq=(πd^3 x fs / 16) ……(6)

386279.67 = (3.14 x d^3 x fs / 16)

Now taking the dia of shaft as 20 mm and check for induced stress.

fs induced = 42.85 N /mm^2

As the induced stress 42.85 N /mm^2 is very less than allowable 100 N /mm^2 the design is safe

CAPACITY: 100 bags/hour

CALCULATION FOR ROLLER

Minimum torque between the two parallel rollers for no load condition

Assume F= 2 kg

Roller diameter= 64 mm,

T=F*r, T= 2*32, T= 64 kg.mm

T= 6.4 kg.cm

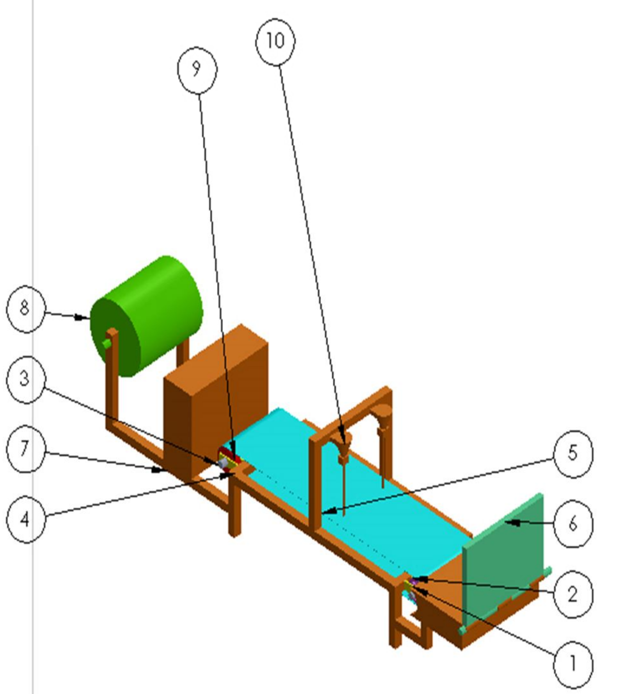
Required minimum torque for rollers is 6.4 kg.cm

Calculation for motor selection for roller:

P= v*I P= 12 * 0.2

P = 2.4 watt

We can take motor selection from this power rating with 100 rpm



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	CLAMPS/HOLDING CLIPS	For holding ROllers and bearing	2
2	Rollers	MS	2
3	SHAFY NO.01	MS ROD DIA 20	2
4	MAINFRAME	MS SQUARE PIPE	2
5	CONVEYER BELT	polymer	1
6	FOLDING ARRANGEMENT		1
7	PAPER CUTTING MECHANISM	MS	1
8	PAPER Roller		1
9	BEARING	SKF	
10	GLUE arrangement		

FIG.1. - CAD MODEL ASSEMBLY

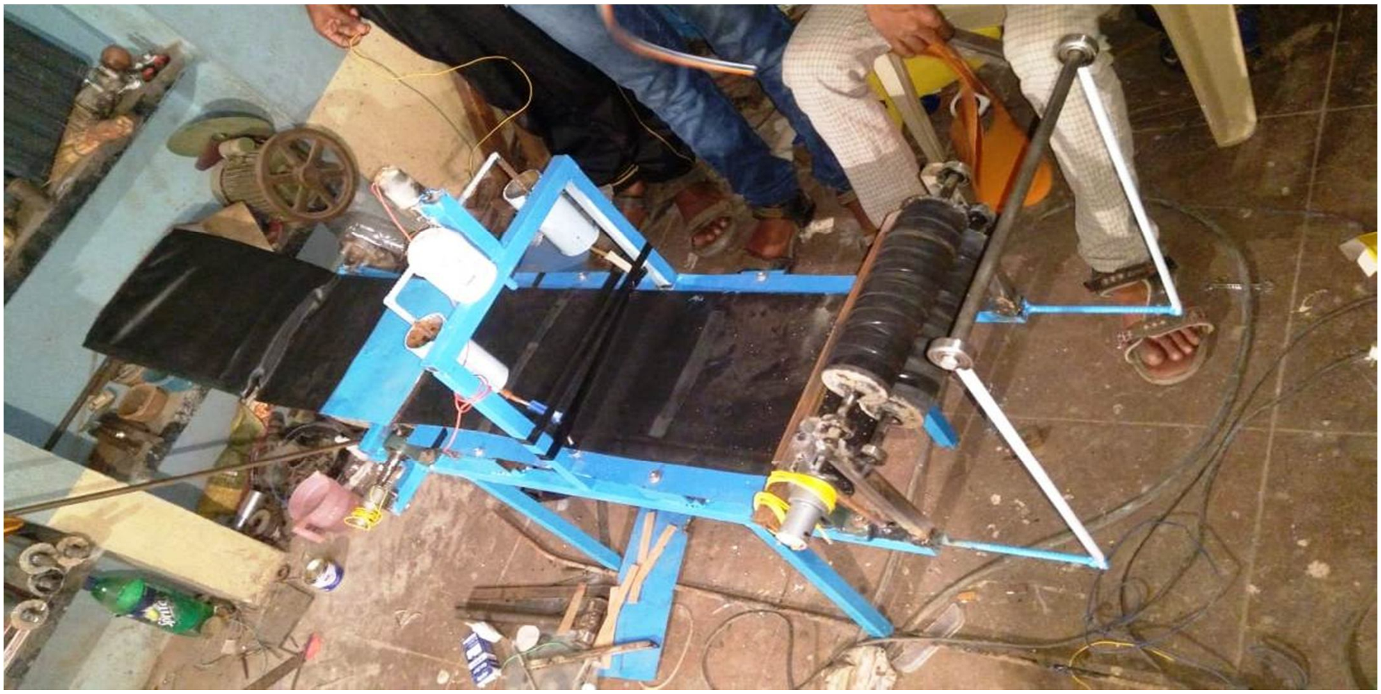


Fig 2: Final working model

IV. COMPONENT SPECIFICATIONS

A. Motor

1) *30RPMJOHNSONS 12V DC:* Geared motors for robotics applications. Very easy to use and available in standard size.Nut and threads on shaft to easily connect and internal threaded shaft for easily connectingit to wheel.Features
   a) 30RPM 12V DC motors with Gearbox
   b) 6mm shaft diameter with internal hole
   c) 125gm weight
   d) Same size motor available in various rpm
   e) 2kgcm torque
   f) No-load current = 60 mA(Max), Load current = 300 mA(Max)
2) Features of 10 RPM Johnson Gear DC Motor 12V:
   a) Rotations per minute: 10 rpm with gear box.
   b) Output torque range: 5kg-cm to 7kg-cm.
   c) No-load current = 800 ma (max).
   d) Load current = up to 9.5 a (max).

Fig.3 Motor

3) *Frame*
a) Material: Mild steel (MS)
b) Size:1270mm*365mm
c) Height:405mm

Fig.4 Frame

4) *Roller*
a) Materiel: mild steel
b) Length:285mm
c) Diameter:50mm
d) Roller supporr:4mm

Fig.5 Roller

5) Belt:
a) Materiel: Rubber
b) Length:1760mm(end to end)
c) Thickness:1.5mm

Fig.6 Belt

Table 1: Actual cost of the system

Sr.No	Item	Quantity	COST
1	dc motor	6	3200
2	sheet metal	1	500
3	conveyer	1	250
4	roller	4	800
5	stud	1	500
6	ms square pipe(frame)	1	500
7	ms plate	1	350
8.	bearings	10	2500
9	power supply	1	800
10	coupling	5	600
11.	fabrication	-	3000
12	other	-	1500
	total		17150

V. FUTURE SCOPE

Our machine is semi-automatic in future we can make it fully automatic and using controller. Also we can improve capacity by making it more precise. Also in future various shape and sized bags can be made on same machine.

A. Applications

1) For Making Paper Envelope
2) For Enclosing Letters
3) For Broachers
4) For Pharmaceutical Application

VI. CONCLUSION

We have design and develop an automated Paper bag making machine for different objectives and to integrate all the objectives together using microcontroller. 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 man power and to increase the efficiency and quality of the product. This system contains the parts which are easily available and low cost. Almost all the single paper folding machines currently available in the market are very much expensive. As compared to other machine this machine is cheaper because of easy available of components and easy to fabricate with low cost.

REFERENCES

[1] N. R. Patil, Jonathan Lobo, AqueelMadki, RohitBhande, ShripadBodhankar.“Automated Paper Bag Making Machine”

[2] Mangesh M. Daundkar, Mrs. Bhairavi N. Savan,“An Optimized Embedded System for Automated Paper Bag Production”

[3] Subramanian SenthilkannanMuthu, 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

[4] MangalGogte, “Are Plastic Grocery Bags Sacking the Environment?”,International Journal for Quality research UDK- 504.5:675.5,Economics Department K J Somaiya College of Arts & Commerce Vidyavihar, Mumbai 400 077, India

[5] 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.

[6] S.Shashank, Rajath, Nayan Kumar .V, Harish A.G, S.M. Narasimhan “Portable Paper-Bag Making Machine”

[7] ThivankaKasunGunawardena, P R Dadigamuwa and B G D A.MadhusankaLow Cost Automated Machine for Paper Gathering and Folding”

[8] Subramanian SenthilkannanMuthu, Yi Li, J.Y. Hu, PhD1, P.Y. Mok,Xuemei Ding “Eco-Impact of Plastic and PaperShopping Bags

[9] S.Shashank1 , Rajath2 , Nayan Kumar .V 3 , Harish A.G4 , S.M. Narasimhan5 BE Students Department of Electronics and Communication NIE, Mysuru, India Portable Paper-Bag Making Machine

[10] Chao Zhao , QingjinPeng and PeihuaGuDevelopment of a paper-bag-folding machine using open architecture for adaptability

[11] PLμS Programmable Limit Switches are often used on paper bag making machinery to increase production and qualityPaper Bag Making MachineryElectro Cam Corp.

[12] PremshilNagrale , AkashGaurikar, DhairyasheelGawande , NiteshKatre , Rahul Hedau , SagarRathod , KetanTonpe . B.E. Student, Department of Mechanical Engineering, Suryodaya College of Engineering & Technology, NagpurFabrication of Paper Bag Making Machine

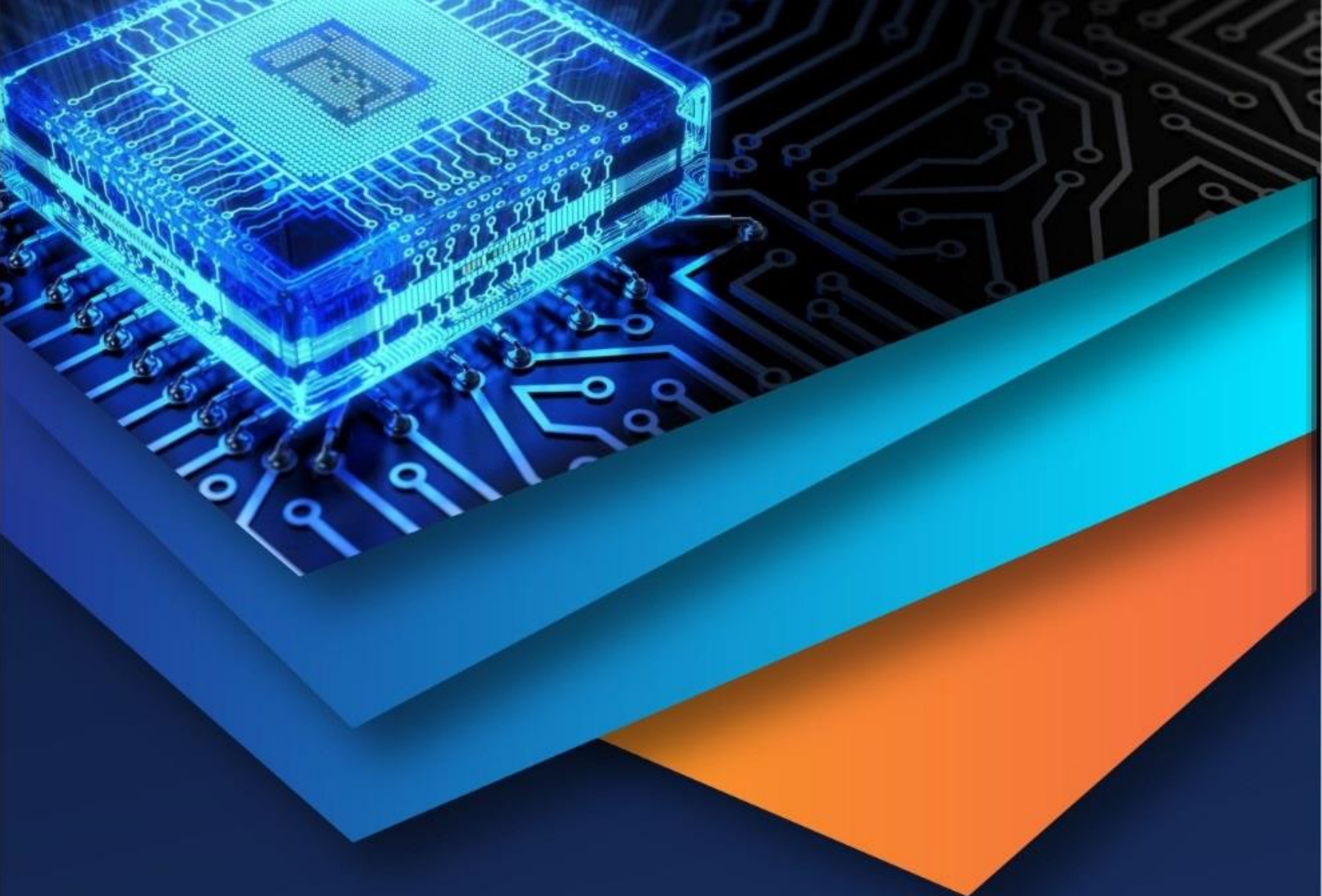
[13] SílviaCalretas, Mário S. Ming Kong and Pedro Januário, “ Paper-folding and Digital Systems: A New Approach to Architectural Logic and Structural Design” in 3rd International Conference on Informatics, Environment, Energy and Applications IPCBEE vol.66 (2014)

[14] Margaret E. Knight, “Paper Bag making machine”, US Patent No. 116842,.

[15] William R Purvis, “Paper Bag making machine”, US Patent No. 434461.

[16] ThivankaKasunGunawardena, P R Dadigamuwa 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): 40-43 Research Article ISSN: 2394 - 658X

[17] David. H.Myszka, “Machines And Mechanisms Applied Kinematic Analysis”, Prentice Hall, 2012.



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