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P.M. NIKHIL

School of Mechanical Engineering, SASTRA University, Thanjavur, Tamilnadu-613401,  
nikhil.pm@yahoo.co.in

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# DESIGN AND PROTOTYPING OF ENVELOPE PASTING MACHINE

P.M. NIKHIL<sup>1</sup>, NEVIL BHARAT SAVLA<sup>2</sup>, NEERAJ RANJAN<sup>3</sup>

<sup>1</sup>School of Mechanical Engineering, SASTRA University, Thanjavur, Tamilnadu-613401

<sup>2</sup>Department of Mechanical Engineering, IIT Bombay, Mumbai-400076

<sup>3</sup>Department of Physics, IIT Bombay, Mumbai-400076

**Abstract-** Envelopes are the basic means used for communication. They come in different shape and size. These are used for sending letters, parcel, admit cards for entrance exams, telephone bills, electricity bills, etc. Before sending these envelopes they have to be folded and pasted which is done manually due to which a lot of effort and time is wasted. This paper discusses the development of a machine that folds and pastes the envelope thereby minimizing the human effort and time.

**Keywords-** Envelopes; Folding rod; Conveyer belts

## I. INTRODUCTION

An envelope is a common packaging item, usually made of thin flat material. It is designed to contain a flat object, such as a letter or card. An envelope consists of a flap on which gum is applied for pasting the envelope. In places like post offices and various administrative offices, lakhs of envelopes are manually pasted everyday which makes the work, time-consuming and tedious. Similar is the case with telephone bills and electricity bills. To encounter this problem a machine is made that applies gum to the flap, folds the flap and presses the flap to paste the envelope.

## II. CONCEPTUAL DESIGN AND SPECIFICATION

The process of pasting the envelope is carried out in 3 steps in the machine. They are as listed below:

- 1-Applying glue on the flap
- 2-Folding the flap
- 3-Pressing the flap

Fig 1 shows the designed machine.



Fig1. Designed Envelope Folding and Pasting machine

As shown in the above figure, the designed machine consists of two conveyor belts, one above the other with a gap of 1.5mm between them so that it provides sufficient force to prevent the tilting of the envelope while carrying out the process of folding and pasting. These conveyor belts are passed over nylon pulleys. One DC motor each is connected to the two pulleys on one side. When these motors are rotated in opposite directions, the upper part of the lower belt and the lower part of the upper belt will move in the same direction thereby moving the envelopes from one end to the other. The upper belt is kept wider than the lower one so that it presses the envelope against the pressing plate after the folding stage. Various mechanisms used for carrying out the operation of folding and pasting are discussed below.

### A. Applying glue

Envelopes enter the machine through the small gap between the two conveyor belts. Fig 2 shows it.



Envelope goes in from here

Fig 2. Two rollers between which the envelope is fed manually

For applying glue to the envelope a pulley with a rubber grip on it is provided. This pulley is coupled with the lower roller. When the roller rotates, the pulley also rotates dipping itself in the glue box provided beneath the roller. Fig 3 shows the arrangement of the pulley with the glue box below it.



**Fig 3. Gluing Mechanism showing pulley arrangement**

The envelope is fed to the machine in such a way that the flap of the envelope will come over the glue pulley thereby applying glue on the flap of the envelope.

**B. Folding the flap**

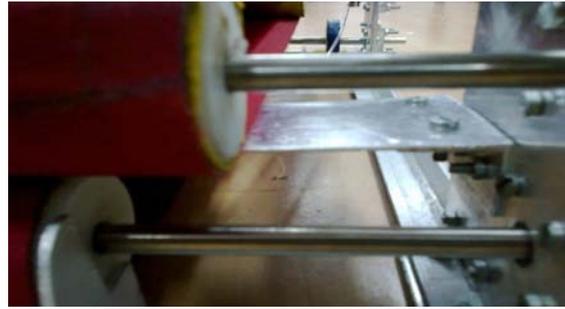
Once the glue is applied on the flap, it has to be folded. A rod bent in the shape of an arc of a circle kept at an angle is provided for that. This rod extends from the point where glue is applied to the flap, till the pressing plate where the folded flap is pressed. Radius of the arc is optimized as 52.8 cm. The arc subtends an angle of 27.4 degree at its center. The arc is tilted by an angle of 15.6 degree and it covers a depth of 1.5cm. Fig 4 shows the arrangement of the bending rod.



**Fig.4. Folding mechanism showing the rod arrangement**

**C. Pressing the flap**

Once the glued flap is folded, it has to be pressed properly so that the glue sticks properly. For this purpose, a pressing plate is provided below the upper conveyer belt such that it does not touch the lower belt. When the envelope comes above the pressing plate, it is pressed by the upper conveyer belt thereby allowing proper sticking of the flap. Fig5 shows the arrangement of the pressing plate.



**Fig.5. Arrangement of the pressing plate**

In addition to these mechanisms, a stack mechanism is also made. This helps to enter the envelopes into the machine one by one from a stack of 100 envelopes.

**D. Stack mechanism**

Feeding envelopes one by one to the machine is again a tedious task. To eliminate it a mechanism is designed so that a pile of envelope can be fed to the machine at a time. The machine will take the envelopes one by one. This stack mechanism consists of a roller that is driven by a DC motor. Above this roller the pile of envelopes are kept with a weight above it to provide a downward pushing force. A small slit with a slit width slightly greater than the thickness of the envelope is provided between the stack and the conveyer belt mechanism. When the roller rotates, it pushes the envelopes through the slit. Since the slit width is small, only single envelope pass through it at a time. Once the envelope comes out of the slit, it is carried away by the two conveyer belts. Fig 6 shows the arrangement of the envelope in a stack and Fig 7 shows the slit and roller provided in the mechanism.



**Fig 6. Arrangement of envelopes in stack**



**Fig7. Slit and roller provided in the mechanism**

### III. CONCLUSION

This machine uses two 60 rpm motors for driving the two flat nylon sandwich belts (one motor for one belt). It can paste one envelope in 3 seconds. This machine can be used for pasting the envelopes containing IIT JEE admit cards where the envelopes have to be fed manually

### IV. ACKNOWLEDGEMENTS

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