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Design, analysis and manufacturing of semi automatic book binding machine

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ABSTRACT

This semi-automatic book binding machine can be used to bind pages which is very important in libraries, govt. departments, offices, companies, lawyers, and book covers generally to maintain their books and records in good condition. This book binding machine is designed to performed operations semi-automatically. In term of the semi-automatic machine, it uses a different mechanism such as gripping mechanism, nut and bolt mechanism, folding mechanism, etc. This machine is designed and construct that can bind book which is in A4 size. It can minimize human energy consumption in order to bind books

Keywords— Gripping mechanism, Folding mechanism, Vacuum gripper, Nut and Bolt mechanism

1. INTRODUCTION

There are many types of Book Binding Machine available to bind the book. All these types of binding machine are designed to bind books manually. It uses human energy to bind the book. Human has limited capabilities and these may lead to consuming human energy and more time. This semi-automatic book binding machine is designed to minimize the usage of human energy in binding the book. This machine combines all operations together which reduces fatigue to the operator. It has the following objectives:

- To modify an existing machine in such a way that it will lead to reduction in space requirement.
- To combine all operations on the single workstation so that one single operator can handle the machine.
- To make it versatile by providing some controllable parameters in the machine itself.
- To reduce the cost by arranging all operations on a single workstation with better design.
- The operation should be smooth and minimize human efforts by making some operation automatic.
- The single operator should able to handle the machine.



Fig. 1: Setup of Book binding machine

1.1 Gripper mechanisms

The gripper used in this machine are as follows:

1.1.1 Vacuum gripper: It is used to grasp cardboard sheet and cover page and place it over folding mechanism. Gripper mechanism should be light weight as possible and should carry load easily. Therefore vacuum gripper is selected. For cost estimation, the gripper should be simple designed and manufactured, easy to maintain and reliable.

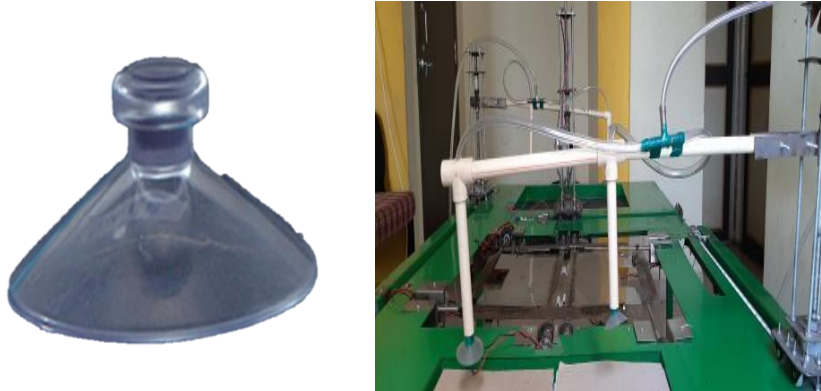


Fig. 2: Vacuum gripper

1.1.2 Mechanical gripper: It is used to grasp a bunch of paper and hold it properly until it is released. For these purpose mechanical gripper is used which is operated by nut and bolt mechanism

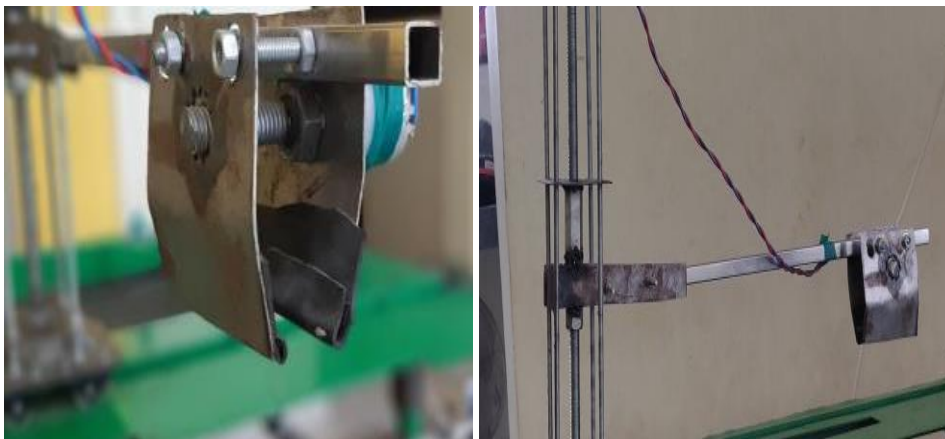


Fig. 3: Mechanical gripper

1.2 Folding and Flipping mechanisms

Angular motion of the folding plate is achieved by using two gears in which one is driven by 3rpm dc motor. The flipping plate is placed at the edge of the plate for the flipping purpose of cover page over cardboard which is also driven by 30rpm dc motor to rotate it in 180° . Due to movements of plates, resin paper is stick to hard cover. Return movement of plates is done by anticlockwise movements of motors.

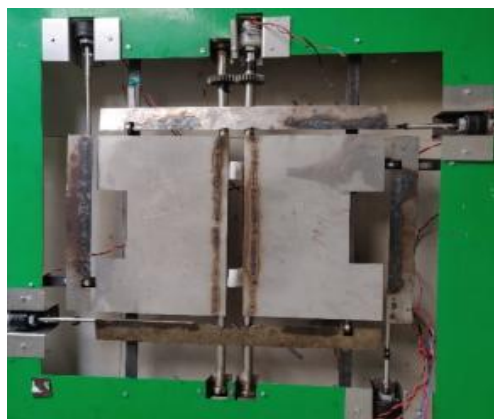


Fig. 4: Folding and flipping mechanism

1.3 Mechanisms for linear motion

To achieve linear motion, nut and bolt mechanism is used which convert the rotational motion of dc motor into linear motion. Dc motor is attached to 12 mm threaded rod which drive nut whose rotational motion is prevented and free to travel linearly. By changing the direction of rotation of dc motor the linear motion direction is changed. The nut carries mounting over as shown in fig.

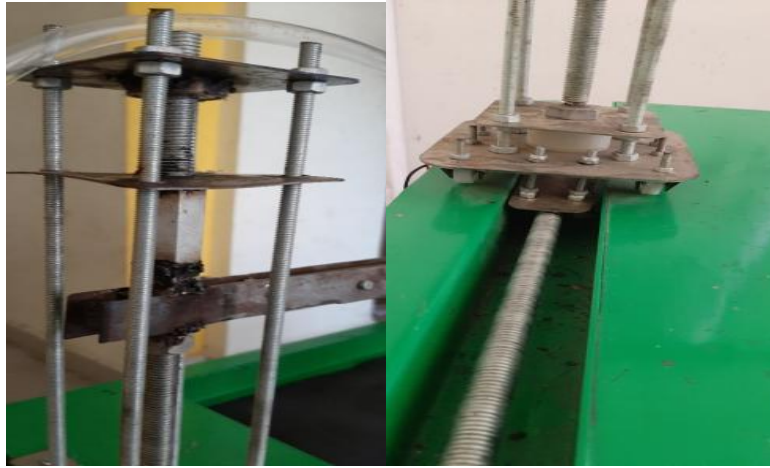


Fig. 5: Nut and bolt mechanism for linear motion

2. CONCLUSION

This book binding machine is designed to performed operations semi-automatically. In term of the semi-automatic machine, it uses a different mechanism such as gripping mechanism, nut and bolt mechanism, folding mechanism, etc.

This machine is designed and construct that can bind book which is in A4 size. It can minimize human energy interference in order to bind books. The consumer only just push the button to make this machine functioning.

3. FUTURE SCOPE

- We can make it fully automatic by using PLC and microcontroller.
- Various sensors can be used to increase accuracy.
- Making it flexible to accommodate different size of pages.

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