

Development of Half Cutting, Creasing and Perforating Machine

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ABSTRACT: After printing the paper half cutting, creasing and perforating operations are required. For this operation time and cost required is more. So, to save time and cost we have developed small machine. This Half Cut Sticker Label Cutting Machine is a multipurpose and can be easily converted to perforator and creaser. Perforating is required on banker's cheque books, Bill Books and creasing is required to make a fold on wedding cards and Office files. Now a day's hand operated machines are used to perform half cut cutting, Creasing and Perforating. These machines are very heavy and costly and also the pressure exerted on the paper is complete cut at certain distance. So we have developed electric motor operated machine which can operate on effective cost and within less time. The detail design and manufacturing of machine is given in this paper.

KEYWORDS: Half cutting, creasing, perforating, Design.

I. INTRODUCTION

Small labels printed on adhesive coated sheet needs cutting without cutting the lower attached paper, For this a most suitable machine is needed which cut the printed sheet without cutting the lower paper attached to the adhesive coated printed sheet. This machine cuts the upper printed paper only in one linear direction and then this sheet is cut perpendicular to the first direction without cutting the back paper. For an even cutting, the machine is fitted with hardened and grounded steel roller with disc type cutting blades and an attachment is provided to set the cutting depth of cutter up to the thickness of the upper printed sheet. It is very easy & simple to operate [1].

The creasing machine is designed for the final processing of graphic materials. Creasing allows for simple bending of wedding announcements, invitations, publicity material etc. The creasing machine can also be used to fold the files [3]. Perforation is operation of creating serrations on paper in line. This application of perforation is required on Bankers cheque book, bills (light, etc.). Perforation provides easy tearing of paper as per requirement. A rotary blade for an interchangeable rotary cutter comprising perfectly spaced teeth. The perforation means producing the holes on the paper equally spaced. The rotary cutter or blade are passed over the paper and because of this equally spaced holes are created on the paper [5].

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II. RELATED WORK

Now a days hand operated machines are used to perform Half cut cutting, Creasing and Perforating. These machines are very heavy and costly, also the pressure exerted on the paper is complete cut at certain distance. We have visited various printing presses in Kolhapur namely Rajhouns printing press in Nagala ark, Art bureau in udyamnagar, Alhad printing press in ravivar peth. We also visited many Xerox shops and stationary shops for gathering more information of half cutting, creasing and perforating operations. After detail survey of such type of machines we decided to manufacture Half Cutting, Creasing and Perforation machine.

III. PART LIST

Part Name	Material	Quantity
Motor	Standard	1
Gear box	M	1
Plate	MS	2
Shaft	MS	1
Bearing	Gun Metal	10
Feeder Board	Plywood	2
Sprocket (□□50)	Standard (EN 8)	4
Sprocket (□□150)	Standard (EN 8)	1
Base	Wood	1
Screw	MS	80
Connector	MS	4
Guide shaft	MS	1
Main Shaft	EN 8	1
Bolt	MS	10
Spring		10
Roller	Fiber	7
Perforating Half cut tool	WPS	1
Chain	Standard	2

Table 1: Part list for machine

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1) Gear box:



Figure 1: Worm and worm wheel gearbox

We have used worm and worm wheel gearbox for speed reduction. Superior in quality, efficiency and performance, the range of worm gearbox are available in various features and specifications such as horizontal, vertical and shaft mounted type.

2) Connectors:

We have fabricated connectors and it is used for supporting the two walls of machine. There are total four numbers of connectors used in this machine. The bottom connector is to supporting of motor and gear box which is fixed on wooden board.

3) U-Block:

It is used for supporting the shaft. The shaft on which the brackets are slide. The shaft is fixed on this U-Block. There are total six numbers of U- Blocks. The three U Block are fixed on each walls. To avoid lift of shaft from U-Block the sheet metal plates are fastened on top surface of U Block using screw.

4) Walls (Plate):

It is used to supporting shaft, Rollers. The Three rollers are fixed into plates. The holes are drills into plate & rollers are supported on this plate with help of Bearing. As likes the rollers the U-Blocks, feeder board this accessories are attached.

5) Roller:

There are three Rollers in machine. On this Rollers paper is passing by help of fiber rollers which are attached to the bracket. The central roller is hard chrome because operation is carried out on this roller and other two roller are grinded.

6) Leveling Screw:

It is supported whole assembly of machine. It is used for leveling purpose; because of this machine is rest properly on floor. It is screw with the help of connector by using stud. It is also adjust the height of machine.

7) Electric Motor:

Half HP electric motor is selected to supply electric power to the machine and sprocket chain power transmitting mechanism is used.

8) Sprocket and Chain:

We have decided to use sprocket & chain mechanism of Bicycle. There are also get two sprockets. 1st smaller sprocket which is mounted on Gearbox shaft & another larger sprocket is used to drive the main roller shafts. The larger sprocket teeth are 48 & smaller sprocket teeth 17 respectively.

9) Feeder board:

The function of feeder board is to feed the papers into the machine. The feeder board is wooden board on which sun mike is fixed using fevicol.

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IV.MACHINE WORKING

When electric supply is start the motor is turn on. The motor is coupled with gear box with the help of coupling, Hence output shaft of gear box is rotated . The drive is transferred to the rollers with the help of chain drive, the chain which is on the sprocket hence rollers are rotated .The motor is rotated in clockwise direction and gearbox output shaft is rotated in anticlockwise direction of roller which is transferred from gearbox output shaft paper is moved in forward direction. The rollers which are mounted on bracket are guided the paper, brackets are guided the paper brackets are placed on the shaft we can change the position of the bracket as per requirement.



Figure 2: Half Cutting, Creasing and Perforation machine

There are three cutters which are creasing, perforation and half cut are fixed on the bracket we adjust the pressure of the 3 cutters and seven fibre rollers by using screw the pressure using screw the rollers and cutters are come back to original position.

V.CREASING OPERATION

A Creasing operation is used to fold the file. In our machine the creasing cutter is rest at the third shaft or last shaft. Firstly the paper is passed over shaft 1 and fiber rollers are guided to this paper then paper is moving in forward direction, after that paper is passed between the groove of creasing bar and that time creasing cutter apply pressure on the paper. Hence the folding operation is carried out. The pressure on the paper is adjusted manually.



Figure 3: Creasing Operation

When the screw is tighten the cutter bar moves in downward direction. Hence it can be produces pressure on the paper. By loosening or tightening we can easily adjust the pressure. The spring is used for retracting the cutter in original

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position. The cutter is made up of mild steel. The small radius is produced on the periphery of the cutter which is matches with groove of creasing bar.

VI.PERFORATION OPERATION

The main application of perforation operation is that produces the holes on the paper which are equally spaced. E.g. bill book. In our machine the perforation operation is carried out by rotary perforating tool which is made up of special material WPS. As same mechanism like creasing operation the only cutter is replaced. Instead of creasing cutter, the perforation cutter is used.

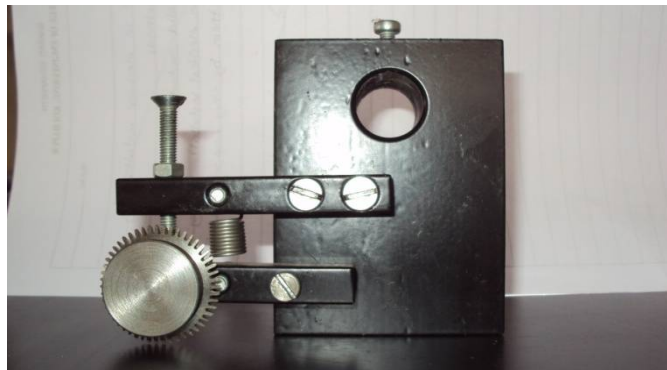


Figure 4: Perforation Operation

The pressure on the paper is adjusted manually. When the screw is tighten the cutter bar moves in downward direction. Hence it can be produces pressure on the paper. By loosening or tightening we can easily adjust the pressure. The spring is used for retracting the cutter in original position as similar to creasing operation.

VII.HALF CUT STICKER CUTTING OPERATION

In our machine the operation is carried out named as half cut sticker label cutting machine. It is very precise operation; the accurate pressure is required to perform this operation.



Figure 5: Half Cut Sticker Cutting Operation

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The half cutter is placed as similar block like creasing and perforation. The cutter is made up off a special material WPS. When edge of the cutter is rolled on the sticker then the upper portion is cut & lower portion is not cut. If the pressure is not adjusted properly then lower paper is also cut .The operation is as similar to the other operation.

VIII.FIBER ROLLERS

Fiber rollers are used only for guide the paper. Because of this roller the paper is move in forward direction smoothly. These fiber rollers are placed on the similar block on which all cutters are placed.

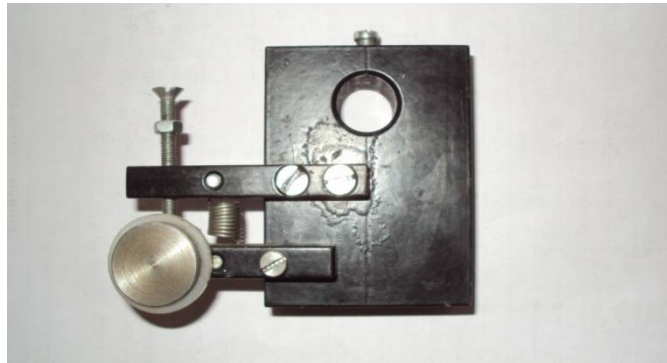


Figure 6: Fiber Rollers

There is having seven fiber rollers are used in our machine. These rollers are placed in different position on the shaft for proper guiding the paper .The pressure is also similarly adjusted as per the mechanism.

XI.TOTAL COST OF MACHINE

Machining Charges:

No.	Operation Name	Working Hrs	Rates Rs.	Total Rs.
1	Turning	21.5	60	1290
2	Drilling.	80 holes	25/Hole	2000
3	Tapping.	80 holes	10/Hole	800
4	Milling.	15	100	1500
			TOTAL	5590/

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Total charges and final machining cost:

Sr.No.	Description Charges	Total Rs.
1	Mtl. Charges	9720
2	Machining Charges	11450
3	Labour Charges	2000
4	Transportation Charges	950
5	Miscellaneous Charges	360
	TOTAL	24480

X. ADVANTAGES OF MACHINE

1. The machine is compact in size and simple in operation.
2. Less time required for operation as compared to hand cutting that is five papers per minute.
3. The half cut, creasing and perforation operations are carried out on only one machine.
4. As compared to other machines this machine is cheaper in cost.
5. Pressure of cutter is easily adjusted by manually.
6. Special attachments can be made in the machine as per the requirement.
7. Simple in construction and less number of parts.
8. Unskilled worker can operate the machine easily.

IX. FUTURE SCOPE

1. It is used for only linear cutting, We cannot do curve operations.
2. Special cutters are required and cost is high.
3. More time is required for operation as compared to automatic cutting machines.
4. Manually paper feeding is required.
5. In running conditions the machine produces more noise

II. CONCLUSION

Half cutting, creasing and perforating machine is simple in construction as there is not so much complication in design. It is also important that the velocity ratios can easily determine measuring no of teeth of sprocket. The machine is constructed in such a way that it will require minimum space to install as the motor of the bracket is inside the machine stand and not outside the machine the space is considerably saved. There are no sharp edges in machine frame so it can be handled safely without an injury and machine is portable.



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