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DESIGN AND FABRICATION OF PAPER CUTTING MACHINE

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ABSTRACT

Now days we have seen hacksaw, chisels, metal cutter, for cutting the paper on industries. In this project we use chart paper as a cutter for doing cutting operation. For using this project we can reduce the man work and the frictional effect and also reduce the effect of noise at the time cutting operation

1. INTRODUCTION

The paper-cutting machine is a recent development in the industrial world. The difficulty of making a successful machine of this kind to meet the new demands for accuracy, speed, convenience, and safety, has been overcome gradually in recent years and there are now several machines quite efficient and adequate to meet these demands of the modern manufacturer. Cutting jobs have an important place in the printing industry. All paper products from the smallest label to all types of posters, brochures, magazines, books, newspapers and billboards have to be prepared according to a specific size. For this reason guillotine paper cutters are required both, in pre-printing and post-printing. Guillotine paper cutters are used in the printing sector; to correctly size the paper in accordance with the printing machine that is used to carry out the printing process, to separate any extra copies that have been printed and to cut off any excess from the edges of papers that have been printed and bound. With regards to work quality and customer satisfaction, cutting is a highly delicate matter in the printing industry. All cutting jobs produced under rapidly developing technological conditions must adapt to certain standards of quality. Otherwise, printing houses face the risk of losing their customers. The most common cutting range of cutting materials used in printing is paper, paperboard and cardboard. Such cutting materials are categorized as soft, normal and hard. Copy paper, tissue paper, drying paper and silk paper are all soft materials. Valuable papers such as printing paper, cardboard, bond-bill paper are normal cutting materials. Hard cutting materials, however, are materials such as coated paper, chrome paper, paperboard, label paper and adhesion paper. Guillotine paper cutters are of steel and steel alloy. This steel alloy composition determines the life of the blade. The durability of the blade is also closely related to the cutting material used. If blades for soft and normal cutting materials are used on hard cutting materials they will quickly wear out and become blunt. The main reason for this is that hard cutting materials display great resistance during cutting. Blade angles also have an important place in cutting jobs. Blades with small angles require less cutting strength compared to blades with larger angles. Blades with small angles cannot remain strong in hard and flexible cutting materials; they will bend or eventually wear out. For example, a blade with a small angle is not forced with soft and high stowing but it is forced with hard stowing and so it is quickly worn out. A very important decision is made with the selection of the knife material and the grinding angle. Both factors are crucial for cutting quality and the number of cuts with a sharp knife. Different kinds of materials for cutting and the production requirements play an important role.

In our project the following components and mechanism are used to make that cutting operation

- Rack and pinion mechanism
- Dc motor
- Battery
- Switch
- blade

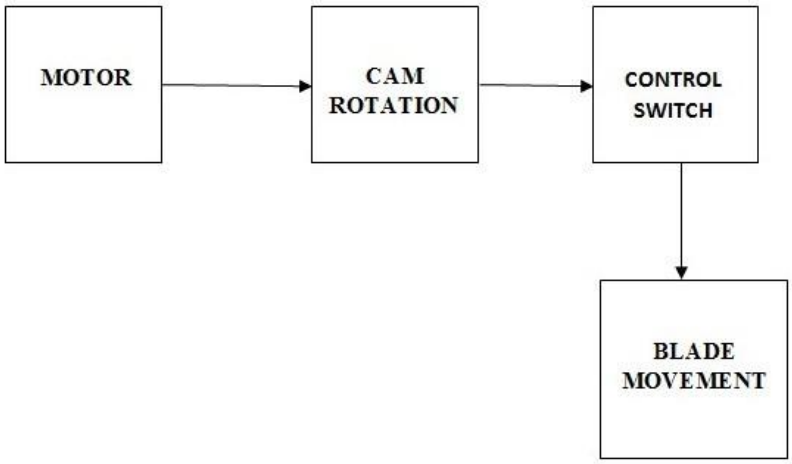

Fig 1.1 Block diagram of cutter arrangement

1.1 RACK AND PINION MECHANISM

A **rack and pinion** is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack"; rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion.

1.2 DC MOTOR

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. In our project we are using electromagnetic motor as a component

Electromagnetic motors: A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. The direction and magnitude of the magnetic field produced by the coil can be changed with the direction and magnitude of the current flowing through it. A simple DC motor has a stationary set of magnets in the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. The windings usually have multiple turns around the core, and in large motors there can be several parallel current paths. The ends of the wire winding are connected to a commutator. The commutator allows each armature coil to be energized in turn and connects the rotating coils with the external power supply through brushes. (Brushless DC motors have electronics that switch the DC current to each coil on and off and have no brushes.)The total amount of current sent to the coil, the coil's size and what it's wrapped around dictate the strength of the electromagnetic field created. The sequence of turning a particular coil on or off dictates what direction the effective electromagnetic fields are pointed. By turning on and off coils in sequence a rotating magnetic field can be created. These rotating magnetic fields interact with the magnetic fields of the magnets (permanent or electromagnets) in the stationary part of the motor (stator) to create a force on the armature which causes it to rotate.

1.3 BATTERY

Fig 1.2 Rechargeable battery

A battery used to supply electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device. When a battery is connected to an external circuit, electrolytes are able to move as ions within, allowing the chemical reactions to be completed at the separate terminals and so deliver energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of the battery to perform work

1.4 SWITCHES

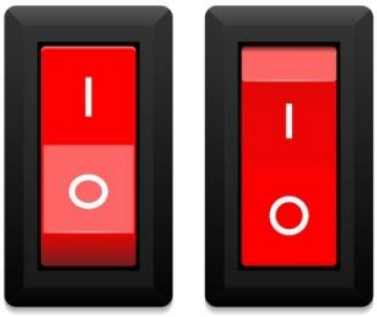

Fig 1.3 switch

A switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch may be operated directly by a human operator to control a circuit.

1.5 BLADES

Fig 1.4 paper cutting knives

A paper cutter (also referred to as paper trimmer, paper guillotine or simply a guillotine) is a tool often found in offices and classrooms, designed to cut a large set of paper at once with a straight edge. Paper cutters vary in size, usually from about 30 centimeters (1 ft) in length on each side for office work to 841 millimeters (33.1 in) (an edge of A1 paper) in design workshops. The surface will usually have a grid either painted or inscribed on it, often in half-inch increments, and may have a ruler across the top. At the very least, it must have a flat edge against which the user may line up the paper at right-angles before passing it under the blade. It is usually relatively heavy, so that it will remain steady while in use. On the right-hand edge is a long, curved steel blade, often referred to as a knife, attached to the base at one corner. Larger versions have a strong compression coil spring as part of the attachment mechanism that pulls the knife against the stationary edge as the knife is drawn down to cut the paper. The other end of the knife unit is a handle. The stationary right edge of the base is also steel, with an exposed, finely-ground edge. When the knife is pulled down to cut paper, the action resembles that of a pair of scissors, only instead of two knives moving against each other, one is stationary. The combination of a blade mounted to a steady base produces clean and straight cuts, the likes of which would have otherwise required a ruler and razor blade to achieve on a single page. Paper cutters are also used for cutting thin sheet metal, cardboard, and plastic. The blade on a paper cutter is made of steel which makes it almost impossible to break.

2. EXPERIMENTAL SETUP

Fig 2.1 paper cutting machine setup

2.1 WORKING PRINCIPLE

In our project first of all the switch is turn on at that time the current flows from battery and passed to electic motor. Due to that current rotor arrangement of dc motor will rotate which produce rotating motion of the motor. Rack and pinion arrangement which is connected to dc motor will move forward and backward based on the rotation of dc motor. At the end of the rack and pinion arrangement a paper cutter blade arrangement is fixed for the purpose of cutting operation .continuous movement of motor will produce the cutting operation continuously

3. CONCLUSION

This machine is very useful for small and medium scale industries. This machine is used to cut the paper and small thickness of sheet. Therefore there may be the chances of increase in production rate by simultaneously cutting the number of sheets in a single pass. Reduction of man power. Reduction in cost as compare to conventional machines. Is the major advantage of this project.

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