Design and Fabrication of Multi Purpose Wood Working Machine

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Abstract: Simplification of engineering and precise control of manufacturing process can result in significant cost saving. The most cost effective way, which can pay big dividends in the long run, is flexible manufacturing. Manufacturing need not be high ended and to be sophisticated. By employing DFMA (design for manufacturing and assembly) technology we achieve most attractive results. It required conscious effort to identify areas where this technology can be implemented. Circular saw machines and grinding machines are used in wood working industry on a large scale in many countries. The scope based on the existing wood cutting machine and the appropriate of DFMA methodology. The machine designed and manufactured can perform multiple operations at the same time on wood with required speed and controlled or operated by motor. It can perform cutting, grinding and buffing operations. In this paper, the preliminary design, valuation of design requirements and the design results are described. We are sure that the information contained in this paper would certainly prove useful for better insight in the scope and dimension of this project in its true perspective.

Index Terms **– Multipurpose woodworking, DFMA, Belt drive, Cutter, Buffing, Grinding.**

I. INTRODUCTION

Cutter is a device used to cut the required objects. This project we are fabricating the Design and Fabrication of Multi Purpose Wood Working Machine. This Design and Fabrication of Multi Purpose Wood Working Machine is used to cut the various equipments in industrial fields. This is a new innovation of industrial field. Manual cutting powered so this equipment is easily operated, portable and cost is less so this is very useful for cut the various objects in industrial fields.

II. LITERATURE REVIEW

A good woodcutter uses the best equipment, and works safely. A good woodcutter works responsibly to get the best yield from the woodlot. A good woodcutter loves the forest and manages it with an eye for future generations."The Good Woodcutter's Guide" is the first book in more than two decades to focus on the essential tools and information that enable owners of more. Woodcut—occasionally known as xylography—is a relief printing artistic technique in printmaking in which an image is carved into the surface of a block of wood, with the printing parts remaining level with the surface while the non-printing parts are removed, typically with gouges. The areas to show 'white' are cut away with a knife or chisel, leaving the characters or image to show in 'black' at the original surface level. The block is cut along the grain of the wood (unlike wood engraving where the block is cut in the end-grain).

The surface is covered with ink by rolling over the surface with an ink-covered roller (brayer), leaving ink upon the flat surface but not in the non-printing areas. Multiple colors can be printed by keying the paper to a frame around the woodblocks (where a different block is used for each color). The art of carving the woodcut can be called "xylography", but this is rarely used in English for images alone, although that and "xylographic" are used in connection with blockbooks, which are small books containing text and images in the same block. Single-leaf woodcut is a term for a woodcut presented as a single image or print, as opposed to a book illustration. In both Europe and the Far East, traditionally the artist only designed the woodcut, and the block-carving was left to specialist craftsmen, called block-cutters, or Formschneider in Germany, some of whom became well known in their own right - among the best known are the 16th century

Hieronymus Andreae (who also used "Formschneider" as his surname), Hans Lützelburger and Jost de Negker, all of whom ran workshops and also operated as printers and publishers. The formschneider in turn handed the block on to specialist printers. There were further specialists who made the blank blocks. This is why woodcuts are sometimes described by museums or books as "designed by" rather than "by" an artist; but most authorities do not use this distinction. The division of labour had the advantage that a trained artist could adapt to the medium relatively easily, without needing to learn the use of woodworking tools. There were various methods of transferring the artist's drawn design onto the block for the cutter to follow. Either the drawing would be made directly onto the block (often whitened first), or a drawing on paper was glued to the block. Either way, the artist's drawing was destroyed during the cutting process. Other methods were used, including tracing.

In both Europe and the Far East, such as Japan and China, in the early twentieth century some artists began to do the whole process themselves. In Japan, this movement was called Sōsaku hanga, as opposed to the Shin hanga movement, which retained the traditional methods. In the West, many artists used the easier technique of linocut instead. In Europe, Woodcut is the oldest technique used for old master prints, developing about 1400, by using, on paper, existing techniques for printing on cloth. One of the more ancient woodcuts on paper that can be seen today is *The Fire Madonna* (*Madonna del Fuoco*, in Italian), in the

Cathedral of Forlì, in Italy. The explosion of sales of cheap woodcuts in the middle of the century led to a fall in standards, and many popular prints were very crude. The development of hatching followed on rather later than engraving. Michael Wolgemut was significant in making German woodcuts more sophisticated from about 1475, and Erhard Reuwich was the first to use cross-hatching (far harder to do than engraving or etching). Both of these produced mainly book-illustrations, as did various Italian artists who were also raising standards there at the same period.
At the end of the century Albrecht Dürer brought the Western woodcut to a level that, arguably, has never been surpassed, and greatly increased the status of the *single-leaf* woodcut (i.e. an image sold separately). As woodcut can be easily printed together with movable type, because both are relief-printed, it was the main medium for book illustrations until the late-sixteenth century. The first woodcut book illustration dates to about 1461, only a few years after the beginning of printing with movable type, printed by Albrecht Pfister in Bamberg. Woodcut was used less often for individual ("single-leaf") fine-art prints from about 1550 until the late nineteenth century, when interest revived. It continued to be important for popular prints until the nineteenth century in most of Europe and later in some places.

III. MATERIALS/COMPONENTS REQUIRED

3.1 AC MOTOR

Ac synchronous motor is a distinguished by a rotor spinning and coil Passing magnets at the same rate as the alternating current and resulting magnetic field which drives it. Speed is independent of the load provided and sufficient field current is applied. Accurate control in speed. This motor power factor can be adjusted to unity by using a proper field current relative to the load. Motor converts electrical power to mechanical power in its rotor. There are several ways to supply power to the rotor; this ac motor power is induced in the rotating device. Since motor has no significant current rise on starting, this motor is ideal to an application which requires six or more starts per minute. One winding to other results reversal of motor direction.

Single pole three position switch can be used for Forward, Reverse & Off control as shown in the following diagram. Metal varistor oxide may be used to minimize the switch contact arcing. Motor will not be overheated if stalled because starting; full load and no load currents are same. However prolonged operation against a solid stop will eventually produce bearing failure due to the resultant shaft vibrations. The motors are having extremely rapid starting; there is a limit to the inertia load at which the motor will start from rest. Power coated cast aluminum body with steel shaft.

3.2 PULLEY

A pulley is a wheel with a groove along its edge, also called a sheave, for holding a rope or cable. Pulleys are usually used in sets designed to reduce the amount of force needed to lift a load. The same amount of work is necessary for the load to reach the same height as it would without the pulleys. The magnitude of the force is reduced, but it must act through a longer distance. The effort needed to pull a load up is roughly the weight of the load divided by the number of wheels. The more wheels there are, the less efficient a system is, because of more friction between the rope and the wheels.
The pulleys and lines are weightless, and that there is no energy loss due to friction. It is also assumed that the lines do not stretch. With this assumption, it follows that, in equilibrium, the total force on the pulley must be zero. This means that the force on the axle of the pulley is shared equally by the two lines looping through the pulley. The lines are not parallel, the tensions in each line are still equal, but now the vector sum of all forces is zero.

3.3 BELT

Belts are used to mechanically link two or more rotating items. They may be used as a source of motion, to transmit power at up to 98% efficiency between two points, or to track relative movement. As a source of motion, a conveyor belt is one application where the belt is adapted to continually carry a load between two points. A belt may also be looped between two points so that the direction of rotation is reversed at the other point. Power transmission is achieved by specially designed belts and pulleys. The demands on a belt drive transmission system. Belts normally transmit power only on the tension side of the loop. Designs for continuously variable transmissions exist that use belts that are a series of solid metal blocks, linked together as in a chain, transmitting power on the compression side of the loop.

3.4 BEARING

A bearing is a device to permit constrained relative motion between two parts, typically rotation or linear movement. Bearings may be classified broadly according to the motions they allow and according to their principle of operation. Low friction bearings are often important for efficiency, to reduce wear and to facilitate high speeds. Essentially, a bearing can reduce friction by virtue of its shape, by its material, or by introducing and containing a fluid between surfaces. By shape, gains advantage usually by using spheres or rollers. By material, exploits the nature of the bearing material used. Sliding bearings, usually called bushes bushings journal bearings sleeve bearings rifle bearings or plain bearings. rolling-element bearings such as ball bearings and roller bearings. Jewel bearings, in which the load is carried by rolling the axle slightly off-center. fluid bearings, in which the load is carried by a gas or liquid magnetic bearings, in which the load is carried by a magnetic field. Flexure bearings, in which the motion is supported by a load element which bends. Bearings vary greatly over the forces and speeds that they can support. Forces can be radial, axial (thrust bearings) or moments perpendicular to the main axis. Bearings very typically involve some degree of relative movement between surfaces, and different types have limits as to the maximum relative surface speeds they can handle, and this can be specified as a speed in ft/s or m/s.

3.5 CUTTERS AND GRINDING WHEEL

Cutters and grinding wheels are selected according to the shape and size of wood working required. These cutters are hardened to with stand the wear during machining of wood works. Grinding wheels are selected according to the accuracy required in wood work; these are done by selecting the appropriate grain size of the grinding wheels. These are holded firmly on the machine table to cut heavy wood works.

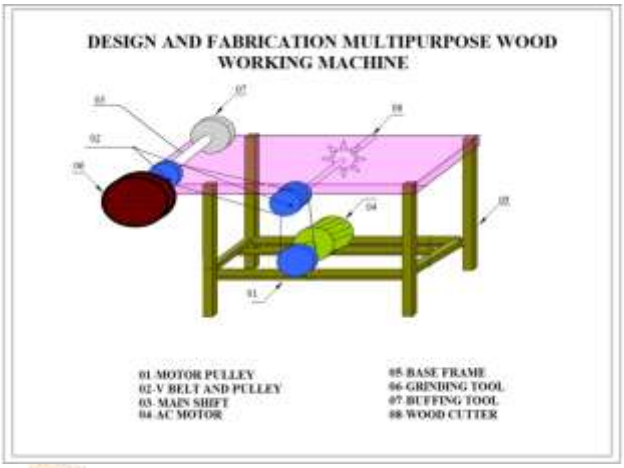

Fig.1. 2D Model of Multipurpose Woodworking Machine

IV. DESIGN CALCULATION

DESIGN CALCULATION FOR MOTOR DRIVE

P =2750W
N =1400RPM
I = 25A
ɵ =20°
Motor specification
Rpm =1440
Volt= 230
Watt = 180
Amps = 25
Hp = ¼
Ph = 1

Motor calculation

Electrical (electric) power equation:

Power $P = I \times V$

Where,
I = 25 amps
V = 230

$P = I \times V$

$= 25 \times 230$

$= 5750$

To find the torque of the motor

P = 2x3.14xnxt/60
T = px60/2x3.14xnxt
T =5750x60/2x3.14x1440
T= 38.15 N-m

V. WORKING PRINCIPLE

Setup consists of frame, wood cutter, grinding wheel, buffing wheel, shafts, bearings, v-belts, pulleys & motor as shown in fig.1. Initially frame is fabricated with help of M.S. angles keeping in mind the location of different parts to be mounted. According to design specifications and availability in market wood cutter, grinding wheel, and buffing wheel are brought and mounted on two different shafts. Then bearings and pulleys of desired specifications mounted on shaft. V-belts used to transmit the power form motor to pulley and one pulley to another. At the end electric a.c. motor is mounted on base of the frame. All assembly is completed and tested in working condition giving desired load and finally the results are analyzed.

Due to the load of machine structure & load of trolley & balancing load, the angle may buckle in two planes at right angle to each other. For buckling in the vertical plane (i.e.in the plane of the angles), the angles are considered as hinged at the middle and for buckling in a plane perpendicular to the vertical plane, it is considered as fixed at the middle and both the ends. The standard

angle available of 25 x 25 x5 mm and we selected the same which can bear the impact loading. The following are the components and their specifications drawn from extensive design.

VI. CONCLUSION

In this paper multipurpose machine having wood cutting, grinding and buffing wheels on single base is described. The practical measurement results have shown that the performance of this machine is better than the existing one. It requires less power for its operation. It is also convenient to move from one place to another, due to its compact size and being installed on the single frame. It is easy for the maintenance with low maintenance cost and requires very less skill for its operation. This machine causes the increase of production capacity. Thus this machine is better choice than machines performing those operations individually.

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