

DESIGN AND FABRICATION OF MULTI FUNCTIONAL OPERATING MACHINE

D MADHUSUDHAN¹
B KUMAR⁴

B BHASKAR REDDY ²
B PRAVEEN KUMAR⁵

V GANGADHAR³
M RAGESH SREENU⁶

*¹Assistant professor, department of ME ,Gates institute of technology, Gooty A.P
*²³⁴⁵⁶ UG Students Department of mechanical engineering ,Gates institute of technology, Gooty A.P

Abstract— This project presents the concept of Multi-Function Operating Machine mainly carried out for production-based industries. Industries are meant for Production of useful goods and services at low production cost, machinery cost and low inventory cost. Today in this world every task has been made quicker and faster due to technological advancement but this advancement also demands huge investments and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost. We have developed a conceptual model of a machine, which would be capable of performing different operations simultaneously, and it should be economically efficient .In this machine we are actually giving a drive to the main shaft to which scotch yoke mechanism is directly attached, scotch yoke mechanism is used for sawing operation. On the main shaft we have use bevel gear system for power transmission at two locations. Through bevel gear we will drive to the drilling centre and grinding centre. The model facilitates us to get the operation performed at different working centres simultaneously as it is getting driven from a single power source. The Objectives of this model are conservation of electricity (power supply), reduction in cost associated with power usage, increase in productivity, and reduced floor space.

Keywords— *cutting ,grinding,drilling,shaping,etc.....*

I. INTRODUCTION

The multipurpose machine for cutting shaping grinding and drilling can be used to make slots in work piece without moving the job to the work table. The slotter is used for cutting grooves, key ways and irregular surfaces both internal and external, for handling large and awkward work pieces, for cutting internal or external gears and many other operation which cannot be conveniently machined many other machine. Industries are basically meant for Production of useful goods and services at low production cost, machinery cost and low inventory cost. Today in this world every task has been made quicker and faster due to technology advancement but this advancement also demands huge investments and expenditure. Every industry desires to make a high productivity rate while maintaining the quality and standard of the product at low average cost. In an industry a considerable portion of investment is being made for machinery installation. So in this project we have proposed a machine which can perform operations like drilling, cutting, grinding and shaping, operations which implies that industrialists have not to pay for machines performing above tasks individually for operating simultaneously. This machine performs the above all operations at the same time with required speed and it is automatic which is controlled or operated by motor which is done with the help of current. This machine may be used in industries and domestic operations which can perform mechanical operations like drilling, cutting, grinding and shaping. Economics of manufacturing: According to some economists, manufacturing is a wealth-producing sector of an economy, whereas a service sector tends to be wealth-consuming. Emerging technologies have provided some new growth in advanced manufacturing employment opportunities in the Manufacturing Belt in Author α σ: Shri Ramswaroop Memorial Group of Professional College, Lucknow, Uttar Pradesh. the United States. Manufacturing provides important material support for national



II. WORKING PRINCIPLE

There are only two major principle on which our proposed machine (conceptual model) generally works: i. Scotch-Yoke mechanism ii. Power transmission through gears. a. Bevel gears c) Scotch Yoke Mechanism The Scotch yoke is a mechanism for converting the linear motion of a slider into rotational motion or vice-versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part. The shape of the motion of the piston is a pure sine wave over time given a constant rotational speed. d) Power Transmission Through Gears Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of a gear is the imaginary toothless surface that you would have by averaging out the peaks and valleys of the individual teeth. The pitch surface of an ordinary gear is the shape of a cylinder. The pitch angle of a gear is the angle between the face of the pitch surface and the axis.

III. LITERATURE SURVEY

Heinrich Arnold¹ November 2001: Rather long re-investment cycles of about 15 years have created the notion that innovation in the machine tool industry happens incrementally. But looking at its recent history, the integration of digital controls technology and computers into machine tools have hit the industry in three waves of technology shocks. Most companies underestimated the impact of this new technology. This article gives an overview of the history of the machine tool industry since numerical controls were invented and introduced and analyzes the disruptive character of this new technology on the market. About 100 interviews were conducted with decision-makers and industry experts who witnessed the development of the industry over the last forty years. The study establishes a connection between radical technological change, industry structure, and competitive environment. It reveals a number of important occurrences and interrelations that have so far gone unnoticed

Dr. Toshimichi Moriwaki (2006): Recent trends in the machine tool technologies are surveyed from the view points of high speed and high performance machine tools, combined multifunctional machine tools, ultra precision machine tools and advanced and intelligent control technologies.

Frankfurt-am Main, 10 January 2011. : The crisis is over, but selling machinery remains a tough business. Machine tools nowadays have to be veritable “jack of all trades”, able to handle all kinds of materials, to manage without any process materials as far as possible, and be capable of adapting to new job profiles with maximized flexibility. Two highly respected experts on machining and forming from Dortmund and Chemnitz report on what’s in store for machine tool manufacturers and users. Multi-purpose machines are the declarations of independence. The trend towards the kind of multi-purpose machining centers that are able to cost efficiently handle a broad portfolio of products with small batch sizes accelerated significantly during the crisis. “With a multi-purpose machine, you’re less dependent on particular products and sectors”, explains Biermann

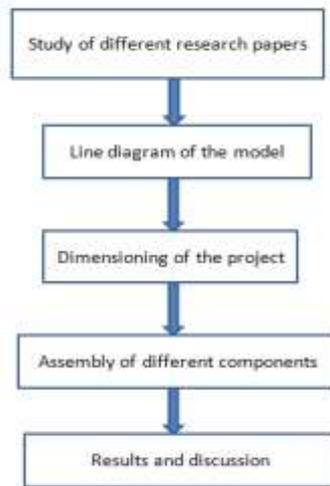
Methodology:

In this project, we have used two mechanism

- Scotch yoke mechanism for hacksaw and shaping operation
- Bevel gear for drilling

With the help of a AC motor power is supplied to the shaft on which a bevel gear is mounted and three more bevel gear, two gears at a right angle to main shaft and one gear opposite to the shaft has been mounted.

At one end of the shaft, power is given through motor and this end is connected to a circular disc through this circular disc for slider mechanism is made for hacksaw and shaping operation. All tools of machine start operating along with main shaft due to meshing between them by means of AC motor. The shaft perpendicular to the main shaft is provided with drill bit. This model of the multi operational mechanical machine may be used in industries and domestic operation which can perform mechanical operation namely drilling, cutting and shaping.



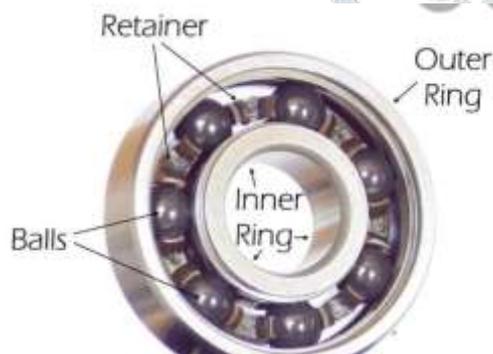
MANUFACTURING PROCESS

Manufacturing processes are the steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part. Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material. The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the production process prior to manufacturing

COMPONENTS

BEARINGS

The bearings are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks. Bearing is made up of steel material and bearing cap is mild steel.



BEVEL GEAR



Bevel gears are [gears](#) where the axes of the two [shafts](#) intersect and the [tooth](#)-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a [cone](#)

GRINDING TOOL



A grinding machine, often shortened to grinder, is one of [power tools](#) or [machine tools](#) used for [grinding](#), it is a type of [machining](#) using an [abrasive wheel](#) as the [cutting tool](#). Each grain of abrasive on the wheel's surface cuts a small [chip](#) from the workpiece via shear deformation.

Grinding is used to finish workpieces that must show high surface quality (e.g., low [surface roughness](#)) and high [accuracy](#) of shape and dimension. As the accuracy in dimensions in grinding is of the order of 0.000025 mm, in most applications it tends to be a finishing operation and removes comparatively little metal, about 0.25 to 0.50 mm depth. However, there are some roughing applications in which grinding removes high volumes of metal quite rapidly. Thus, grinding is a diverse field.

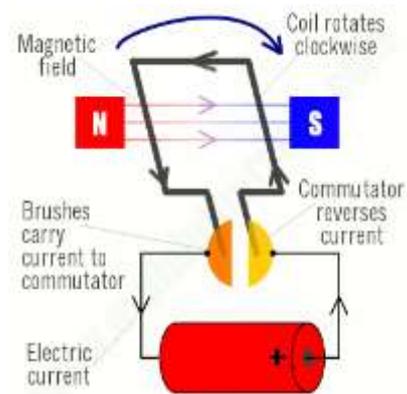
HACKSAW BLADE



Most **hacksaws** are hand saws with a C-shaped walking **frame** that holds a blade under tension. Such **hacksaws** have a handle, usually a pistol grip, with pins for attaching a narrow disposable blade. The **frames** may also be adjustable to accommodate blades of different sizes.

Hacksaw blades should be mounted in their frames with the **teeth** facing forwards. They are designed so that the **blade** will cut on the push – the forward stroke – rather than the pull, or backwards stroke.

MOTOR



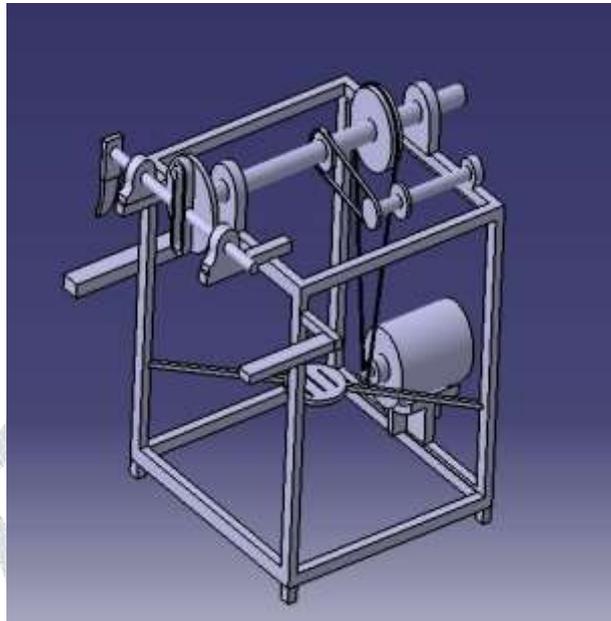
The motor is so chosen in such a way that it is used to drive the worm and worm wheel drive. The ratio have been reduced drastically of about 40:1 ratio.

The motor selected is AC such that it needs to sustain single phase 15 amphis.

An AC motor is an [electric motor](#) driven by an [alternating current](#) (AC). The AC motor commonly consists of two basic parts, an outside stationary [stator](#) having coils supplied with alternating current to produce a rotating magnetic field, and an inside [rotor](#) attached to the output shaft producing a second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets, reluctance saliency, or DC or AC electrical windings.

DESIGNING OF MULTI FUNCTIONAL OPERATING MACHINE

Complete 3D Design using CATIA V5R20



Dimensions of each component and frame

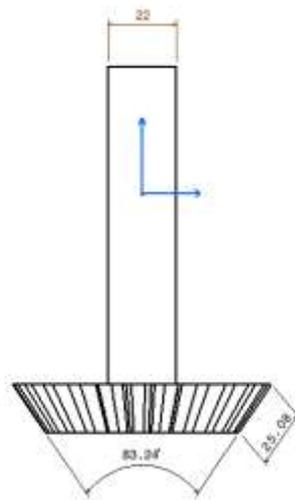


Fig. Bevel gear

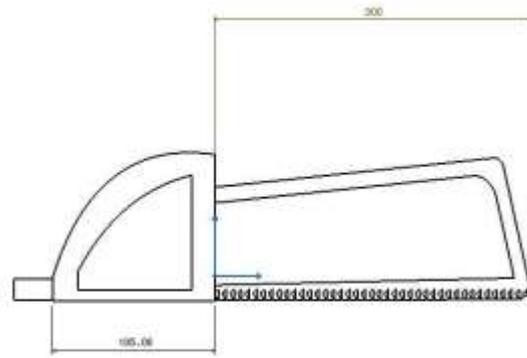


Fig. Hacksaw frame

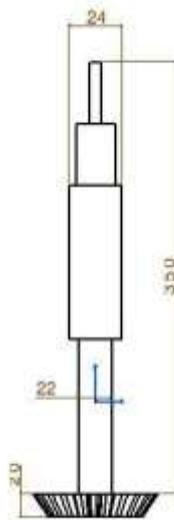


Fig. Drilling pillar

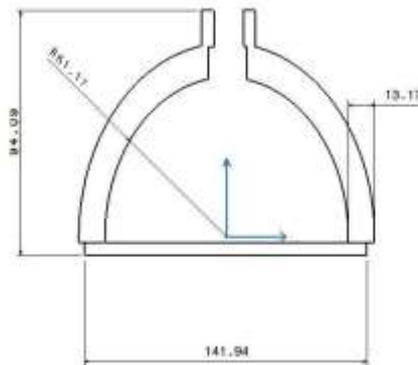
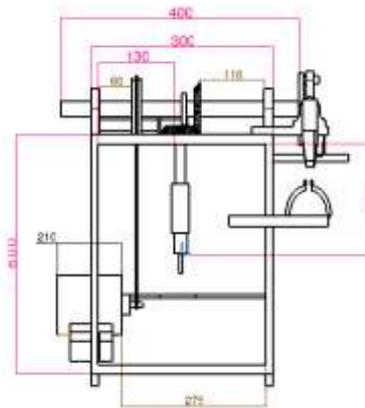
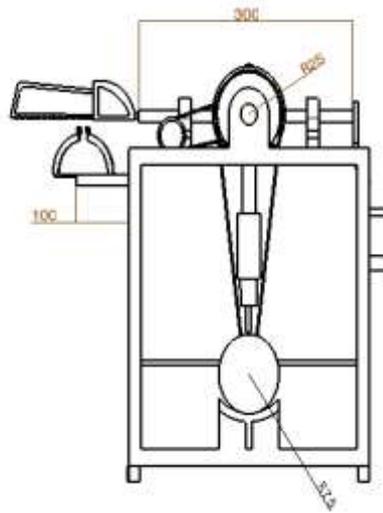


Fig. Job holding vice



ADVANTAGES & DISADVANTAGES

ADVANTAGES

- Multiple operations can be performed at one time
- All operations are performed on only one motor
- Time saving
- size is compact and require s less space
- Less man power required
- low manufacturing and maintaince cost

DISADVANTAGES

- Without human effort its not operated
- Not fit for large scale production

CONCLUSIONS

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institution and the industries.

We are proud that we have completed the work with the limited time successfully. The “FABRICATION OF MULTI PURPOSE MACHINE FOR CUTTING SHAPING GRINDING AND DRILLING” system is working with satisfactory

conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities.

Thus we have developed a “MULTI PURPOSE MACHINE FOR CUTTING SHAPING GRINDING AND DRILLING” which helps to achieve the shaping and hacksaw operation in different places by a single mechanism in a single machine. By using more techniques, they can be modified and developed according to the applications.

REFERENCES

- Heinrich Arnold1”The recent history of the machine tool industry and the effects of technological change “University of Munich, Institute for Innovation Research and Technology Management, November 2001.
- Dr. Toshimichi Moriwaki “Trends in Recent Machine Tool Technologies” Professor Department f Mechanical Engineering Kobe University ,NTN Technical Review No.74(2006).
- T. Moriwaki “Multi-functional machine tool” ,Department of Industrial and Systems Engineering, Setsunan University, Neyagawa, Japan CIRP Annals -
- Manufacturing Technology DOI:10.1016/j.cirp.2008.09.004 .
- Frankfurt am Main “Multi-purpose machines ensure enhanced “, 1 January 11.
- “Selecting and Planning the Process of Manufacture: Dr. Pulak M.Pandey. <http://paniit.iitd.ac.in/~pmpandey>.
- Altan T, Lilly B, Yen YC (2001) Manufacturing of Dies and Molds. Annals of theCIRP 50(2):405–423.
- Altintas Y, Brecher C, Weck M, Witt S (2005) Virtual Machine Tool. Annals of the CIRP’ 54(2):651–704.

