IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 9, May 2025
Impact Factor: 7.67

Design and Fabrication of Multifunctional Operating Machine to Reduce Cycle Time and Floor Space

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Abstract: *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 have been made quicker and fast due to technology 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.*

Keywords: Production

I. INTRODUCTION

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 have been made quicker and fast due to technology 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.

In an industry a considerable portion of investment is being made for machinery installation. So in this paper we have a proposed a machine which can perform operations like drilling, sawing, shaping, some lathe operations at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously.

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 the United States. Manufacturing provides important material support for national infrastructure and for national defense.

OBJECTIVES

- Taking safety as a prime consideration this device is a safer in all respects.
- To reduce the human effort.
- To develop a device this can make work simple
- To develop a device which can be used for a multipurpose operations different.
- To develop a device which can run cost efficient.
- Precision and accuracy.
- Ease of use and maintenance.

II. LITERATURE SURVEY

DRILLING OPERATION

Drilling is the operation of producing circular hole in the work-piece by using a rotating cutter called Drill.

The drilling operation can also be accomplished in lathe, in which the drill is held in tailstock and the work is held by the chuck.

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The most common drill used is the twist drill.

III. GRINDING OPERATION

A variety of bonding materials are used to impart the desired cutting Characteristics to the grinding wheel. For example; a slitting saw is very thin grinding wheel.

Various types of Bonding Materials used in Grinding Wheels are;

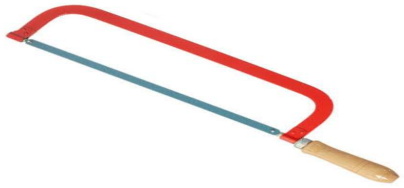
- Vitrified bond
- Silicate bond
- Shellac bond
- Resinoid bond
- Rubber bond
- Oxy Chloride bond

Grinding Wheel

Grinding wheels are composed of selectively sized abrasive grains held together by a bonding agent.
The properties of the grinding wheel are influenced by the following;

- Type of abrasive
- Grain size
- Type of bond
- Grade of the wheel

CUTTING OPERATION



A hacksaw is a fine-toothed saw, originally and principally for cutting metal. They can also cut various other materials, such as plastic and wood; for example, plumbers and electricians often cut plastic pipe and plastic conduit with them. There is hand saw versions and powered versions (power hacksaws). Most hacksaws are hand saws with a C-shaped 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. A screw or other mechanism is used to put the thin blade under tension. Panel hacksaws forgo the frame and instead have a sheet metal body; they can cut into a sheet metal panel further than a frame would allow. These saws are no longer commonly available, but hacksaw blade holders enable standard hacksaw blades to be used similarly to a keyhole saw or pad saw. Power tools including nibblers, jigsaws, and angle grinders fitted with metal-cutting blades and discs are now used for longer cuts in sheet metals.

An abrasive saw, also known as a cut-off saw or metal chop saw, is a power tool which is typically used to cut hard materials, such as metals. The cutting action is performed by an abrasive disc, similar to a thin grinding wheel. Technically speaking this is not a saw, as it does not use regularly shaped edges (teeth) for cutting. The abrasive saw generally has a built- in vise or other clamping arrangement, and has the cutting wheel and motor mounted on a pivoting arm attached to a fixed base plate.

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They typically use composite friction disk blades to abrasively cut through the steel. The disks are consumable items as they wear throughout the cut. The abrasive disks for these saws are typically 14 in (360 mm) in diameter and 64 in (2.8 mm) thick. Larger saws use 410 mm (16 in) diameter blades. Disks are available for steel and stainless steel.

IV. WORKING

This machine is completely works on single AC motor which is connected to 3-phase power supply. In this machine we can conduct various operations as mention in the application below we have prepared this machine in order that it can be used whole year and no season wise the specialty of this machine is that it can conduct various operation in this machine the motor is the main unit and when the motor starts the pulley on the motor shaft rotates then with the help of belt the power is transmitted to the other pulley by maintain the speed required for different operation different mechanism is used the mechanism is shown in block diagram below.

Working Principle:

There are only two major principle on which our proposed machine(conceptual model) generally works:
Scotch-Yoke mechanism
Power transmission through gears.
Bevel gears

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.

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.

V. DESIGN

General Requirements of Machine Design

1. High productivity.
2. Ability to produce and provide required accuracy of shape and size and also necessary surface finish.
3. Simplicity of design.
4. Safety and convenience of control
5. Low Cost.
6. Good Appearance.

Design Procedure

Before we proceed to the process of manufacturing, it's necessary to have some knowledge about the project design essential to design the project before starting the manufacturing. Maximum cost of producing a part of product is established originally by the designer.
The product consists of:
1. Functional design.
2. Product design.
3. Engineering design.

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3D MODEL

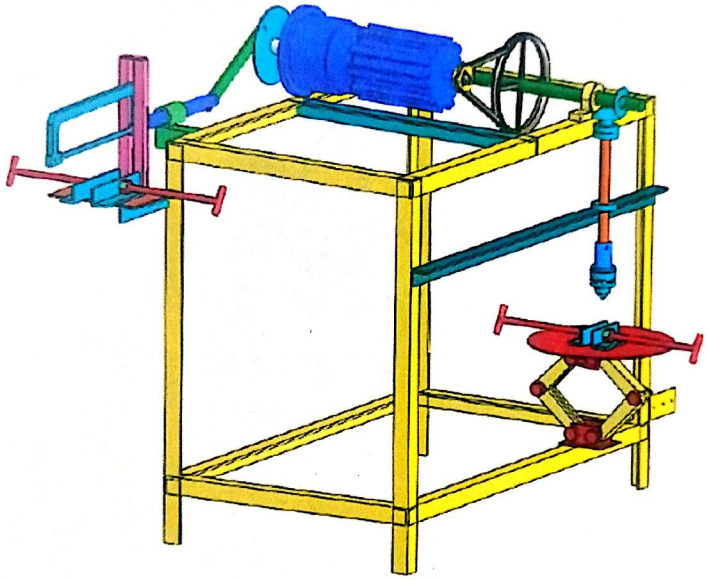

Fig. Isometric View

VI. EXPERIMENTAL SETUP

Fabrication processes

Experimental Set-Up In this conceptual model we have involved the gear arrangement for power transmission at different working centers , basically gear or cogwheel is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part in order to transmit torque, in most cases with teeth on the one gear being of identical shape, and often also with that shape on the other gear. Two or more gears working in tandem are called a transmission and can produce a mechanical advantage through a gear ratio and thus may be considered a simple machine. Geared devices can change the speed, torque, and direction of a power source. The most common situation is for a gear to mesh with another gear; however, a gear can also mesh with a non-rotating toothed part, called a rack, thereby producing translation instead of rotation.

Material Used

Shaft (grinding)

Material: Mild steel

Operation: cutting, facing, turning, threading

L angle

Material: Mild steel

Operation: Bending. Fitting

Bearing

Material: assembly

Operation: Fitting.

Fasteners

Material: Mild steel

Operation: Fitting.

Base plate

Material: mild steel

Operation: cutting, welding, Fitting.

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Drill chuck
Material: mild steel
Operation: fitting

Shaft
Material: Mild Steel
Operation: Cutting

Pulley
Material: Mild shaft
Operation: Cutting, machining

Belt
Material: rubber
Operation: Fitting

chuck
Material: mild steel
Operation: cutting, machining, threading, Fitting

Base plate (motor)
Material: mild steel
Operation: cutting, drilling, Fitting.

Advantages

- It is multi operation machine.
- It is cheaper than other commercial machine.
- It is efficient enough to conduct industrial operations.
- It is affordable for small workshop.
- It is useful in continuous operation.
- It occupies less work space.

Disadvantages

- The dimension of the workpiece in a drilling are limited.
- Since speed reduction is not arranged drilling for higher diameter cannot be done.
- It consumes important working time for shifting the shaft position to switch operation.

VII. CONCLUSION

We have taken up this project as real challenge, as we were not experience in the field. We started our work on this project facing new hurdles initially.

After the completion of the project work, we tried its working in our college machine shop and we were pleased to note that it does meet the requirements for what it is meant.

The maneuverability of the device is quite good and the handling is quite simple. For commercial purpose one can improve the efficiency of the device effectively by increasing the size of the device.

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DOI: 10.48175/568

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