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Drilling, Cutting And Grinding System Mechanism

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Abstract : *This paper presents the concept of Multi-Function Operating Machine mainly carried out for production based industries. 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. We have developed a conceptual model of a machine which would be capable of performing different operation simultaneously, and it should be economically efficient .In this machine we are actually giving 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 give drive to drilling centre and grinding centre. The model facilitate us to get the operation performed at different working centre simultaneously as it is getting drive from single power source. Objective of this model are conservation of electricity (power supply), reduction in cost associated with power usage, increase in productivity, reduced floor space.*

Keywords: *Scotch Yoke mechanism, Drill bit, Bevel gear, Hecksaw, V-Belt Drive.*

I. INTRODUCTION

This machine performs multipurpose operations at the same time with required speed and this machine is automatic which is controlled or operated by motor which is run with help of current.

This machine is based on the mechanism of whit worth's return. This model of the multi operational machine may be used in industries and domestic operations, which can perform mechanical operations like Drilling, cutting and shaping of a thin metallic as well as wooden model Or body.

Problem Statement

This machine performs multi operations at the same time with required speed and this machine is automatic which is controlled and operated by motor and run with the help of current. This machine is based on the mechanism of Whitworths returns.

Mechanism

Mechanism in the simplified model, usually in the form of lined diagram, which is used to reproduce exactly the motion occurring in a machine. The purpose if the reproduction is to enable the nature of motion to be investigated without the encumbrance of the various solid bodies which forms the machine elements.

II. LITERATURE REVIEW

Heinrich Arnold conducted a study with more than 100 decision makers and industry experts who have 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.ToshimichiMoriwaki focused on recent trends in the machine tool technologies. He conducted a survey 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. [1]

Designed and developed a multipurpose machine which does not require electricity for several operations like cutting, grinding etc. This is a human powered machine runs on chain drives mainly with human efforts. But if you wanted to operate this machine by electric power this machine can also does that. It has some special attachment so use both human power as well as electric power. The design is ideal for use in the developing world because it doesn't require electricity and can be built using metal base, chain, pulley ,rubber belt, grinding wheel, saw, bearing, foot pedal (for operated by human) ,electric motor,chain socket.[2]

Modeling can be said to have had its beginning as an organized process in the late 1890s to early 1900s originated with F.W. Taylor's pioneering engineering research and development of empirical methodology (and equations) for estimating reasonably economic machining conditions. Science-based modeling began to emerge in the 1940s by Merchant's physics-based modeling in a machining process.

Computer-based modeling, the "watershed" event of the advent of digital computer technology and its application to manufacturing in general, was started in the 1970s. [3]

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.[4]

To model drilling processes, Lee, Liu and Tarng (1998) described the use of an abductive network composing of a number of self-organized functional nodes by means of a predicted squared error criterion. They predicted the drilling performance in terms of tool life, metal removal rate, thrust force and torque using above network. A simulated annealing technique with a performance index was then applied to optimize process parameters [5].

III. OBJECTIVES

1. The objective of this experiment is to investigate the performance of a whitworth quick turn motion and to verify that the motion does have a quick return stroke and a slow cutting or forward stroke.
2. To reduce size of model.
3. To perform all three operations simultaneously on same machine.
4. Multi operations are performed at one time.
5. We can perform multipurpose operations on thin metallic as well as wooden model.
6. Operation of any complicated components can be done with this machine

Future Scope

1. We can perform various operations like cutting, drilling, or grinding individually by introducing coupling (engagement & disengagement) between them.
2. We can perform grinding operation by introducing a grinding tool at the main shaft.
3. We can perform boring operation by introducing a boring tool by replacing drilling tool.
4. We can change the speed of motor by regulator.

Methodology

In this project we are supplying power to shaft by means of Electrical motor mechanism containing one big pulley and one small pulley which is fitted on shaft and belt on pulley helps to rotating shaft, on which a pulleys are mounted on it by means of motor pulley arrangement. One pulley transmits power by v belt to the grinding wheel under it and also by link attachment the power is transmitted to the hacksaw frame (rotator motion is converted to reciprocating motion). Also other pulley transmits power by v belt to the drilling attachment.

IV. EXPERIMENTAL WORK

The Design and Development of Multi Purpose Mechanical Machine. This machine is based on the mechanism of shaft. The various machining process in manufacturing industries are carried out by separate machining machine. It need more space requirement and time with high expenses. But the fabrication of multi operation machine, which contains three operations in a single machine. The operations are namely drilling, cutting and grinding. It is a new concept specially meant to reduce the work time and save the cost.

This machine perform multipurpose operation at same time with required speed and this machine is automatic which is controlled or operated by motor which is run with the help of current.

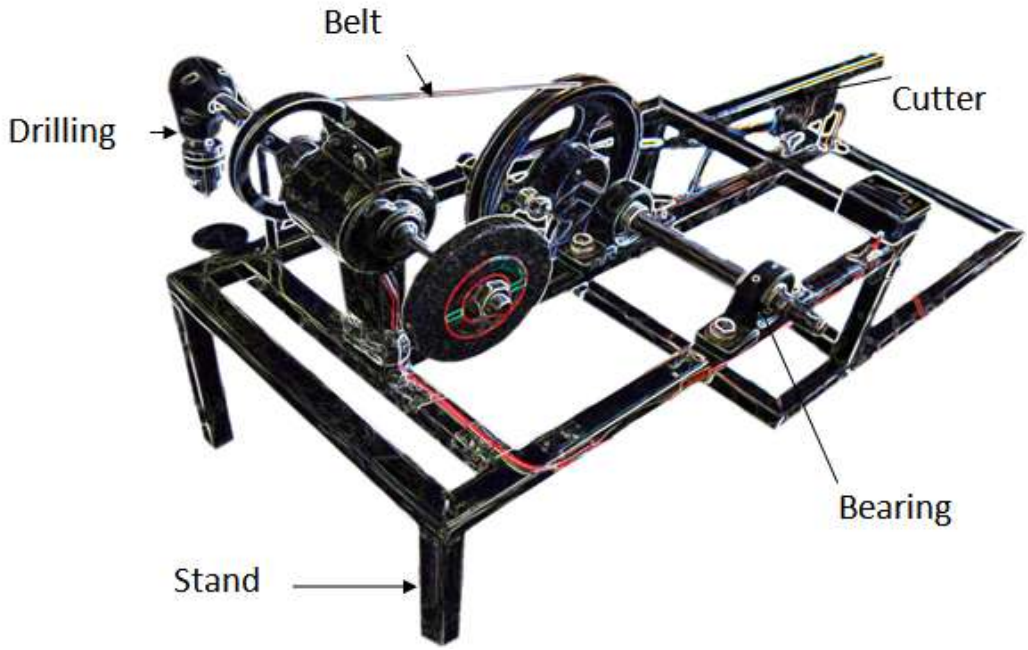

Fig. 01: Sketch Drawing of Project

Machine Equipment

1. Drilling

A drill is a tool fitted with a cutting tool attachment, usually a drill bit used for drilling holes in various materials or fastening various materials together with the use of fasteners. The attachment is gripped by a chuck at one end of the drill and rotated while pressed against the target material. The tip of the cutting tool does the work of cutting into the target material. Drills are commonly used in woodworking, metalworking and construction. Specially designed drills are also used in medicine, space missions and other applications. Drills are available with a wide variety of performance characteristics, such as power and capacity.

2. Cutting

A hacksaw is a fine teeth saw with a blade held under tension in a frame, used for cutting materials such as metal or plastics. Hand held hacksaw consist of a metal arch with a handle, usually a pistol grip, with pins for attaching a narrow disposable blade. A screw or other mechanism is used to put the thin blade under tension. The blade can be mounted with the teeth facing toward or away from the handle, resulting in cutting action on either the push or pull stroke on the push stroke, the arch will flex slightly, decreasing the tension on the blade.

3.Grinding

Producing a flat or plane surface which may be in a horizontal, a vertical or an angular plane.

Fig. 02: Grinding Wheel

4. **Bevel Gear**

A bevel gear is a type of mechanical gear. These 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.

5. **Bearing**

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Many bearings also facilitate the desired motion as much as possible, such as by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

6. Motor Construction

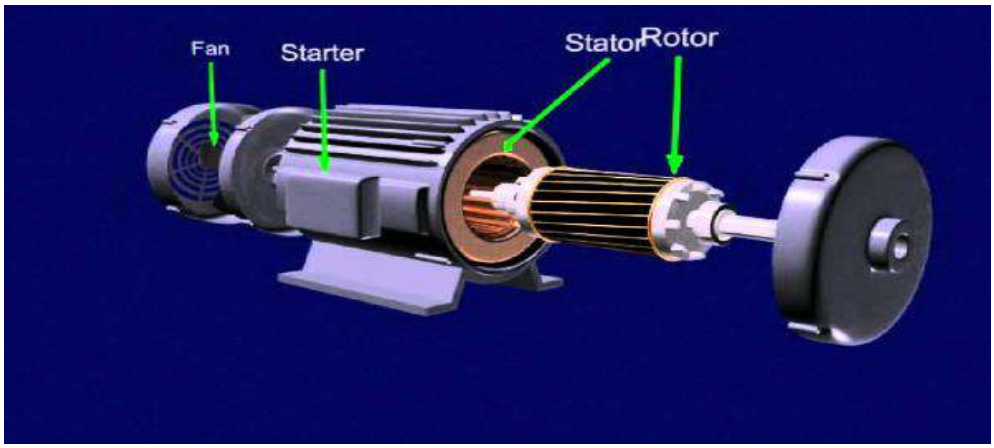

Fig 03: Motor Construction Diagram

Rotor

In an electric motor the moving part is the rotor which turns the shaft to deliver the mechanical power. The rotor usually has conductors laid into it which carry currents that interact with the magnetic field of the stator to generate the forces that turn the shaft. However, some rotors carry permanent magnets, and the stator holds the conductors.

Stator

The stator is the stationary part of the motor's electromagnetic circuit and usually consists of either windings or permanent magnets. The stator core is made up of many thin metal sheets, called laminations. Laminations are used to reduce energy losses that would result if a solid core were used.

V-Belt Pulley

Fig 03: V-Belt Pulley

V-belt pulleys (also called v belt sheaves) are devices which transmit power between axles by the use of a v-belt, a mechanical linkage with a trapezoidal cross-section. Together these devices offer a high-speed power transmission solution that is resistant to slipping and misalignment.

V-Belt Pulley Specifications

- Belt profile, or the style and sizes of the belt being integrated.
- Outside diameter, or the distance across the pulley when measured between groove edges.
- Center diameter is the distance or distances between the shafts of the pulleys in the transmission. V-belt transmissions are limited by center distances, which must be no more than three-times the diameter of the largest pulley, lest significant slipping can occur.
- Grooves, the grooves located on the pulley, including the number, and angle and width of the flanges.
- Pitch diameter, or the diameter of the pulley where the belt is engaged, and is critical to the drives strength-to-weight ratio. Arc of contact, the degree of which the belt wraps around the pulley.

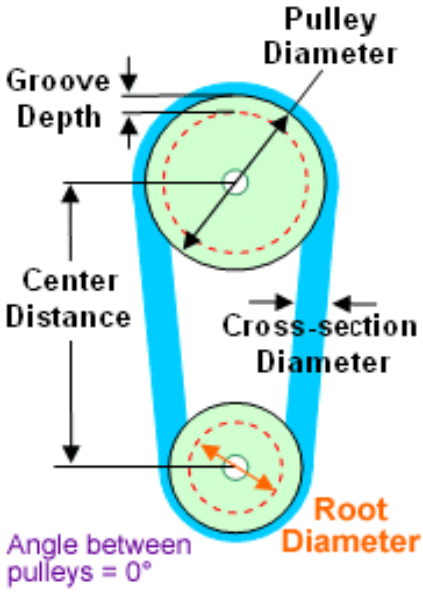

Fig. 04: V-Belt Pulley

A belt is a loop of flexible material used to link two or more rotating shafts mechanically, most often parallel. Belts may be used as a source of motion, to transmit power efficiently, or to track relative movement. Belts are looped over pulleys and may have a twist between the pulleys, and the shafts need not be parallel. In a two pulley system, the belt can either drive the pulleys normally in one direction (the same if on parallel shafts), or the belt may be crossed, so that the direction of the driven shaft is reversed (the opposite direction to the driver if on parallel shafts). As a source of motion, a conveyor belt is one application where the belt is adapted to carry a load continuously between two points.

The arrangement has electrical motors, bevel gears, long shaft, scotch yoke mechanism, drilling and grinding set up. The power is transmitted to the long shaft from the electrical motor which is driven by electrical current. The grinding wheel is attached at the one end of the shaft. The scotch yoke mechanism is placed at the other end for doing cutting action. For making drilling action, bevel gears are arranged at the middle position of the shaft.

All the operations are carried out by giving electrical current to the motor. It converts electrical energy into mechanical energy. Then the mechanical energy is transferred to the rotating shaft and split into different operations.

V. CONCLUSION

A conclusion after completing the major project "Drilling, Cutting And Grinding System Mechanism" we are much happy and would like to thank our professor, guides and the lectures of the concerned department who have guided us.

While making this project we have been able to learn a lot and understand the various aspects of "Drilling, Cutting And Grinding System Mechanism." we can use our knowledge, which we get during our knowledge, which we get during our study.

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