

Fabrication of Multipurpose Mechanical Machine

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ABSTRACT

This thesis deals with the development and fabrication of multipurpose mechanical machine which perform three operations at a time namely drilling, grinding and cutting. Today we see that these operations are the heart of any workshop/machine shop and they are indispensable, so for the time saving of any organization four different operation on four different job can be performed simultaneously. However, jigs and fixtures are required to attain this, but when our need is specified and particular then this machine can be a time saving equipment. This machine is automatic and controlled by electric motor and it is based on the Belt and pulley mechanism. It can be used in small scale industries/workshop to work up on thin metallic sheets and on wood in carpentry shop.

KEYWORDS: Drilling, Cutting, Grinding, etc...

INTRODUCTION

Multipurpose mechanical machines are designed to increase efficiency, productivity, and flexibility in various industries, such as manufacturing, agriculture, and construction. These machines can be customized to meet specific needs and can be easily reconfigured to adapt to changing requirements. A drilling machine, called a drill press, is used to cut holes into or through metal, wood, or other materials. Drilling machines use a drilling tool that has cutting edges. Press drill machine performs operations like countersinking, boring, counter boring, spot facing, reaming, and tapping. Hand drilling machine has a lot of disadvantages like, it requires efforts of the person using it and also it does not provide accurate results. Hence to overcome such disadvantages, a press drill machine is used. In this drill press project, a cutting tool is attached to the drill press by a chuck or Morse taper and is rotated and fed into the work at variable speeds. This Mini Drill press consists of a DC motor, rack and pinion with a wooden frame which provides support to the entire device. This drill press machine also consists of a side shaft gear, a DC motor with a spindle which is attached vertically. For vertical up down motion, rack and pinion provision is given. This drill press machine makes drilling easy and efficient.

LITERATURE REVIEW

A. Rakesh S. Ambade, Komal D. Kotrange et.al. "Paddle operated multipurpose machine"

The survey of the literature regarding pedal driven machine are listed: Dharma Chaitanya Kirtikumar was design and develop of multipurpose machine which does not required electricity for several operation like cutting and drilling etc. This is a human power machine runs on chain drive mainly with human effort. But if we wanted to operate this machine by electric power this machine can also does that. This design is ideal for use in the developing world because it does not required electricity and can be build using metal base, pulley, rubber belt, chain, grinding wheel, saw, bearing, foot pedal for operated by human effort.

Krishnappa R1 , Venkatesh G2 , et. al . “Motorized multipurpose 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 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.

Mr.Gawari Tushar1 , Mr. Gawade Rahul2 , et.al. ‘ Multi Purpose Machine’

This model of the multi operational machine is may be used in industries and domestic orientation which can perform mechanical operation like drilling , cutting and shaping of a thin metallic as well as wooden model or body. 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.

Multipurpose machine we can perform number of operation on single machine. It helps to improve production rate and machining quality. We can see that all the production based industries wanted low production cost and high work rate which is possible through the utilization of multi-function operating machine which will less power as well as less time, since this machine provides working at different center it really reduced the time consumption up to appreciable limit. In an industry a considerable portion of investment is being made for machinery installation. So in this paper we have proposed a machine which can perform operations like drilling, sawing, grinding at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously.

Dr. Toshimichi Moriwaki (2006) “Multi-function operating machine”

Recent trends in the machine tool technologies are surveyed from the viewpoints 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.

COMPONENTS SELECTION RAW MATERIALS:

Table 1. List of components

S. NO	PARTS	QTY	MATERIAL
1	M.S Angular rods	4	Mild steel
2	Drill chuck	1	iron
3	Shaft	2	Iron
4	Bevel gears	5	Iron
5	pulleys	3	Mild Steel

CUTTING PROCESS

Cutting processes work by causing fracture of the material that is processed. Usually, the portion that is fractured away is in small sized pieces, called chips. Common cutting processes include sawing, shaping (or planning), broaching, drilling, grinding. And milling. Although the actual machines, tools and processes for cutting look very different from each other, the basic mechanism for causing the fracture can be understood by just a simple model called for orthogonal cutting. In all machining processes, the work piece is a shape that can entirely cover the final.

DRILLING PROCESS

Drilled holes are characterized by their sharp edge on the entrance side and the presence of burrs on the exit side (unless they have been removed). Also, the inside of the hole usually has helical feed marks. Drilling may affect the mechanical properties of the work piece by creating low residual stresses around the hole opening and a very thin layer of highly stressed and disturbed material on the newly formed surface.

WELDING PROCESS

Introduction to welding process Introduction Welding is a process in which two or more parts are joined permanently at their touching surfaces by a suitable application of heat and/or pressure. Often a filler material is added to facilitate coalescence. The assembled parts that are joined by welding are called a weldment. Welding is primarily used in metal parts and their alloys. Welding processes are classified into two major groups: 1. Fusion welding: In this process, base metal is melted by means of heat.

GRINDING OPERATION

Grinding practice is a large and diverse area of manufacturing and tool making. It can produce very fine finishes and very accurate dimensions; yet in mass production contexts it can also rough out large volumes of metal quite rapidly. It is usually better suited to the machining of very hard materials than is "regular" machining (that is, cutting larger chips with cutting tools such as tool bits or milling cutters), and until recent decades it was the only practical way to machine such materials as hardened steels. Compared to "regular" machining, it is usually better suited to taking very shallow cuts, such as reducing a shaft's diameter by half a thousandth of an inch or 12.7 μm .

ADVANTAGES

- Multi operation can be performed at one time.
- The return stroke is utilized for cutting.
- All operation is performed by only one motor.
- Size is compact and require less space.
- Time saving
- Less man power is required.
- Low manufacturing and maintenance cost.

APPLICATIONS

- Drilling holes in various materials (metal, wood, plastic)

- Grinding and shaping surfaces
- Woodworking
- These machines are particularly beneficial for small businesses that need to perform a range of tasks but have limited space and resources.
- Cutting metal sheets
- In DIY and Home it is used for drilling holes on wood.
- These machines can be used for educational demonstrations, illustrating the principles of mechanical power transmission.

OUTPUT FIGURE

WORKING AND DISCUSSION

A multipurpose mechanical machine utilizes an electric motor to drive various tools through a system of belts, gears, or chains, enabling it to perform multiple operations like drilling, cutting, and grinding. By incorporating interchangeable tool attachments and secure work-holding devices, the machine's design allows for versatile functionality, driven by the transformation of rotational motion into the specific actions required for each task, ultimately providing a cost-effective and space-saving solution for diverse applications in workshops, small-scale industries, and DIY projects. A multipurpose mechanical machine centers on an electric motor, the prime mover, which initiates rotational power. This power is then strategically distributed via belt-pulley, gear, or chain systems, enabling varied speed and torque outputs. These systems drive interchangeable tool attachments, like drill chucks, grinding wheels, or cutting blades, facilitating diverse operations. Workpieces are securely held by vices or clamps, ensuring stability during machining. The machine's design prioritizes versatility, allowing quick tool changes for different tasks. Mechanical mechanisms, such as the scotch yoke, can transform rotary into linear motion for specific cutting or shaping actions. The operator controls the machine, selecting appropriate speeds and tools for each operation. Safety features are integrated to prevent accidents. Ultimately, this machine combines multiple functions into a single unit, maximizing efficiency and minimizing space requirements.

CONCLUSION

After completing the major project on "MULTIPURPOSE MECHANICAL MACHINE" we are much happy and would like to thank our professor, guide and the lecturers of the concerned department who have guided us. While making this project we have been able to learn a lot and understand the various aspect of "multipurpose mechanical machine" we can use our knowledge, which we get during our study. In conclusion, the development of a multipurpose mechanical machine offers a versatile solution for various drilling, grinding and cutting operations. By integrating a DC Motor 230v 75Amp, the machine becomes adaptable to a wide range of materials and applications, including wood, plastic, and metal. Versatility: The machine can perform drilling, grinding and cutting, another mechanical operations on different materials, making it suitable for various projects and industries. Efficiency: With the power and control offered by the DC Motor 230v 75Amp, the machine can achieve high precision and productivity in its operations.

FUTURE SCOPE

1. We can perform various operations like cutting drilling and shaping individually by introducing

coupling (engagement and disengagement) between

2. We can perform boring operation by introducing a boring tool by replacing tool.
3. We can change the motor speed by regulator. Future implementation of your we can add grinding wheel for small tools.

REFERENCES

Research Papers

1. Journal of Manufacturing Processes: Provides peer-reviewed research on manufacturing techniques and technologies, including multipurpose machines.
2. International Journal of Machine Tools and Manufacture: Publishes research articles on machine tools, their design, and applications.
3. Journal of Engineering Manufacture*: Contains articles on mechanical design and manufacturing, including innovative machine concepts.

Books

1. "Design of Machine Elements" by V. B. Bhandari, published by McGraw-Hill Education (2015)
2. "Machine Tools: Specification, Design, and Operation" by Rex Miller.
3. "Manufacturing Engineering and Technology" by Serope Kalpakjian and Steven Schmid.
4. "Manufacturing Processes for Engineering Materials" by Serope Kalpakjian.

Online Resources

1. IEEE Xplore: A digital library for engineering research that contains articles and papers on mechanical design and fabrication.
2. ScienceDirect: Offers a wide range of research papers and articles on multipurpose machines and manufacturing technologies.
3. Google Scholar: A comprehensive search engine for scholarly articles on various topics, including combined drilling and cutting machines.